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Report on Confidential Enquiries  
into Maternal Deaths in  
England and Wales  
1955-1957

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## PREFACE

In 1957 there was published as Report No. 97 of this series a Report on Confidential Enquiries into Maternal Deaths in England and Wales during 1952-1954. The present Report records the account of the investigation continued over the period 1955-1957. For completeness, it should be read in conjunction with Report No. 97 although there are enough comparative data quoted to enable those who do not have the previous Report to appreciate the differences between the findings of the two periods.

In the period under review there occurred 2,149,396 births. Maternal deaths directly due to pregnancy and childbirth during this period numbered 1,112 of which 861 were the subject of this enquiry. In addition to these there were 368 associated deaths, i.e., deaths due to disease occurring during pregnancy or childbirth, of which the enquiry examined 339. To maintain his sense of proportion the reader of the following pages should remember that this report concerns only the 1,480 deaths associated with childbirth and is not concerned with over two million pregnancies which took place without fatal issue to the mother.

It is encouraging to see that the proportion of deaths due to avoidable factors has fallen from 43.1 per cent. to 40.9 per cent.; principally due to the impressive fall in the number of deaths from post-partum haemorrhage with retained placenta.

Though there has been a welcome fall in the number of deaths due to toxæmia of pregnancy, the proportion is about the same as that which was found in 1952-54. There is little doubt that the elimination of avoidable factors in the ante-natal care of expectant mothers could do much to reduce mortality from this cause.

It is greatly to be regretted that a substantial proportion of avoidable factors is still contributed by the mothers themselves.

The importance of age and parity in relation to maternal death is brought out as conspicuously in this series as in the former. Unless corrective steps are taken, age and parity combined may contribute to the risk of a fatal issue to the mother or to the infant.

It is hoped that the publication of this report, and the case records with which its more important features are illustrated, will enable those concerned with the care of expectant and parturient mothers to identify the main avoidable factors in their practice and by identifying them to anticipate them by appropriate action.

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*A REPORT ON CONFIDENTIAL ENQUIRIES INTO  
MATERNAL DEATHS IN ENGLAND AND WALES  
IN 1955-1957*

## 1. HISTORY AND METHOD

In 1952 the Confidential Enquiry into Maternal Deaths, which had begun in 1928, was revised, and "The Report on the Confidential Enquiries into Maternal Deaths in England and Wales, 1952 to 1954" was published in 1957. This present report is a continuation of the enquiry and deals with the years 1955 to 1957. It should be read in conjunction with the earlier report.

The history and method of the Enquiry were described fully in the first report, and this second series follows an exactly similar pattern. The same method of collecting information has been used and the same assessments and collation have been carried out. It is probably true to say, however, that with the reduction in maternal deaths brought about by the introduction of newer methods of treatment and the skilful work of all those engaged upon maternity care, it is inevitable that the criteria for avoidability should have become stricter. Despite this possibility, it is encouraging to note that the proportion of deaths with avoidable factors due directly to pregnancy and childbirth has fallen from 43.1 per cent. to 40.9 per cent. This has been brought about mainly by a remarkable fall in the number of deaths, especially deaths with avoidable factors, due to postpartum haemorrhage with retained placenta.

The report of 1952-1954 studied in detail the major causes of maternal deaths and where the avoidable factors lay, and this has remained the principal aim of this report. In order to facilitate comparison between the two series the layout of the two reports is the same but, in this report, two extra chapters have been added, for an enquiry of this size enables certain relatively rare occurrences to be studied and their significance assessed. Two subjects have accordingly been chosen—"Sudden death in labour" and "Rupture of the uterus"—as providing material of considerable clinical interest.

The total number of maternal deaths directly due to pregnancy and childbirth in the years 1955 to 1957, both those recorded by the Registrar General and those the subject of this report, shows a fall of about one-fifth compared with the years 1952 to 1954, despite an increase in the total births from 2,079,275 in 1952 to 1954 to 2,149,376 in 1955 to 1957. A fall of this order occurs among all causes of maternal death with the exception of haemorrhage, pulmonary embolism and sepsis. Deaths from haemorrhage show a greater fall, while deaths from pulmonary embolism and sepsis have remained much the same. If the deaths due to pregnancy and childbirth are arranged in clinical groups rather than in the sequence of the International Classification, the four largest





groups have undergone some change in their relative importance as compared with the 1952-1954 series as follows:

	<i>Number of deaths</i>		<i>Percentage of total deaths</i>	
	1952-54	1955-57	1952-54	1955-57
Deaths due to toxæmia (including toxæmic accidental hæmorrhage)	246	188	22	22
Deaths due to hæmorrhage (excluding toxæmic accidental hæmorrhage)	188	121	17	14
Deaths due to abortion ... ..	153	141	14	16
Deaths due to pulmonary embolism...	138	147	13	17

The classification of maternal deaths is always difficult since the mother may suffer from multiple conditions, e.g., accidental hæmorrhage and toxæmia, and it is frequently a matter of opinion as to which is the principal cause. In the chapters which follow the same case may therefore be discussed in more than one place—for example, Cæsarean section and post partum hæmorrhage. However, every precaution has been taken to ensure that, as far as possible, the final classification of the death to one single cause has been consistent with that in the first report. For this reason, in the table above the two series are comparable.

As can be seen from the table, pulmonary embolism has increased in importance as a cause of maternal death and one for which, in our present state of knowledge, little can be done as yet. Toxæmia, which remains the largest single cause of death, can, however, be controlled to a large extent by scrupulously careful ante-natal care and early treatment. It is therefore, in the control of this disease that there lies the greatest opportunity of saving maternal lives.

## 2. TOXAEMIA OF PREGNANCY

This heading covers the cases of toxæmia of pregnancy and eclampsia shown in the International Classification of Diseases (1948) under the numbers 642, 685 and 686, plus 17 cases in which, although the cause of death was antepartum hæmorrhage, the patient also had toxæmia.

There was a fall in the number of deaths from toxæmia from 246 in the 1952 to 1954 series, to 188 in the present series, but they still account for just over a fifth of the deaths directly due to pregnancy and childbirth.

Avoidable factors were believed to be present in 103 cases or 54.8 per cent. compared with 52 per cent. in the 1952-1954 series.

Among the 188 cases of toxæmia in this series, 46 women died undelivered, four women miscarried, 67 had stillbirths, 60 had live births and 11 had twins. This shows a much higher proportion of twins than among all births. Of the 11 pairs of twins, six pairs were liveborn, one pair were stillborn, and in the remaining four pairs, one twin was stillborn and the other liveborn.

### AGE

*Table I. Age distribution in the deaths due to toxæmia, compared with the age distribution among all registered births in England and Wales in 1955-57*

Age	Pre-eclamptic toxæmia		Eclampsia		Accidental hæmorrhage with toxæmia		All Toxæmia		Total registered births
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	Per cent.
Under 20	4	4.0	4	5.6	—	—	8	4.3	5.4
20-24..	17	17.2	22	30.6	1	5.9	40	21.3	29.0
25-29..	20	20.2	10	13.9	5	29.4	35	18.6	31.7
30-34..	16	16.2	21	29.2	6	35.3	43	22.9	20.4
35-39..	27	27.3	9	12.5	4	23.5	40	21.3	10.2
40 + ..	15	15.2	6	8.3	1	5.9	22	11.7	3.2
Total	99	100.1	72	100.1	17	100.0	188	100.1	99.9

Table I is exactly comparable with Table I on page 6 of the previous report. There has been some slight change from the last report. The proportion of deaths from pre-eclamptic toxæmia and eclampsia, which occurred among women aged 30 to 34 years was greater than the proportion of all parturient women in this age group in the 1952-1954 series, but this is only true of deaths from eclampsia in the 1955-1957 series. The proportion of deaths due to toxæmia which occurred among women aged 35 years and over has shown a rise from 26.9 to 33 per cent., but the difference between the two percentages is not statistically significant because the numbers are too small.

## PARITY

*Table II. Distribution of parity among deaths due to toxæmia compared with the distribution among all registered legitimate births in England and Wales 1955-57*

Parity*	Pre-eclamptic toxæmia		Eclampsia		Accidental hæmorrhage with toxæmia		All Toxæmia		All registered† legitimate live births
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	Per cent.
1 ..	39	39.8	33	47.1	4	23.5	76	41.1	40.0
2 ..	18	18.4	13	18.6	2	11.8	33	17.8	29.8
3 ..	20	20.4	9	12.9	2	11.8	31	16.8	15.1
4 ..	7	7.1	6	8.6	3	17.6	16	8.6	7.3
5 ..	8	8.2	4	5.7	1	5.9	13	7.0	3.7
6 + ..	6	6.1	5	7.1	5	29.4	16	8.6	4.1
Not stated	1	—	2	—	—	—	3	—	—
All parities	99	100.0	72	100.0	17	100.0	188	99.9	100.0

Table II shows some change in the frequency of primigravidae among the deaths from toxæmia compared with the previous report. There is now practically no difference in the proportion of primigravidae among women who died from toxæmia and all parturient women. However, the higher proportion of primigravidae among the women who died from eclampsia has continued, but the excess is less marked than in the previous report. It has been compensated to some extent by a slightly increased proportion of primigravidae among the women who died from pre-eclampsia. Among all deaths from toxæmia the proportion of women who had borne five or more children has remained at almost twice that among all parturient women.

### PRE-ECLAMPTIC TOXAEMIA AND ECLAMPSIA

In all, there were 171 cases where the primary cause of death was pre-eclamptic toxæmia and eclampsia. Death was thought to be avoidable in 90 cases, 53 per cent. compared with 52 per cent. in the 1952-1954 series. Avoidable factors were present in 51 per cent. of cases of pre-eclamptic toxæmia and 56 per cent. of cases of eclampsia. As before, no cases have been included under this heading unless the evidence was incontrovertible, and indeed of the 11 cases labelled "doubtful" and therefore classed as unavoidable, it was almost certain a lapse had occurred from accepted standards of ante-natal care, though some slight doubt existed usually because the records were inadequate.

\*Throughout this report "parity" is based on previous live and still births, disregarding previous abortions, and including the fatal pregnancy, whatever its duration.

† In this and all subsequent parity tables, the registered legitimate live births in England and Wales are used for comparison. Information on previous stillbirths and illegitimate births is not available. The legitimate births amount to more than 95 per cent. of all births.

Among the 90 cases which were thought to be avoidable, there were 116 identifiable factors. In 83 cases the avoidable factors occurred in the ante-natal period; in three the factors were in both the ante-natal period and labour; in two the avoidable factors occurred during the ante-natal period and puerperium; and in the remaining two cases the avoidable factors occurred during the puerperium.

Twenty-seven of the 90 cases with avoidable factors had been booked for hospital confinement, 34 had arranged for domiciliary care, 14 were booked for confinement in a general practitioner maternity unit, two for care in a private nursing home, and the remaining 13 had made no arrangements. It should be borne in mind when considering these figures that the avoidable factors were not necessarily attributable to the services for which the patients had been booked.

## THE AVOIDABLE FACTORS

### *Inadequate Ante-natal Care*

This group is by far the largest and its importance is enhanced in that the death of each one of these women might have been avoided. It is under this heading that serious, and for these days what can only be regarded as inexplicable, faults appear.

In domiciliary care in more than one instance the general practitioner expressed surprise that it was usual to keep any record of the clinical findings at ante-natal examinations and therefore no records were available. One reply was to the effect that "any abnormality would have been noted." Time and again the following procedure was adopted and must surely be regarded today as completely wrong. A correct diagnosis of pre-eclamptic toxæmia was made either by the midwife or the doctor. This usually, but by no means invariably, led to the advice that the patient should be seen in "One week's time." If at the end of this time the condition had not improved, the patient, often the mother of a large family, was "sent home to bed." Even under these circumstances the same interval of "one week's time" would appear. Failure to improve after a variable period of so called rest usually led to the patient's admission to hospital sooner or later. But this was not always so—in one case sent to bed at home who at the end of seven days was slightly worse, the note was made that "increased rest was ordered." Patients with signs or symptoms of severe pre-eclamptic toxæmia were watched at home for far too long a time, and no consultant opinion or other advice was taken.

Thus "rest at home" for nine weeks with a blood pressure recorded as 150/100 and accompanying albuminuria was allowed in one case. In another, a blood pressure averaging 170/90 was observed for eleven weeks, the patient having been told to "rest at home." In a third case a woman æt 38 expecting her first baby had unwisely been allowed to arrange for the confinement at her own home. Her blood pressure rose to 160/90, the urine was noted to contain albumin "+++" and still no suggestion seemed to have been made that transfer to hospital was advisable. It was not until the blood pressure was recorded as 200/120 that this move, too late, was made. In a fourth case, a woman æt 39 had also been allowed to arrange for her first confinement in her own home.

She developed hypertension, recorded as 180/100 and so great an oedema that she gained 42 lbs. in 11 weeks. She, too, was advised to "rest at home" where she was watched. Lastly, a young primigravida aet 20, to be confined at home, was observed to have a rise in blood pressure from previous readings at 120/80 to about 160/100. Within a relatively short time her weight had increased by over 40 lbs. and albumin was present in the urine. She was "sent home to bed." When eventually she reached hospital, the blood pressure had risen still further and the urine boiled solid.

Such, therefore, are examples of what is meant by inadequate ante-natal care. It is sad to have to note that over 30 additional accounts of cases of a similar nature could be listed.

The intervals at which patients were seen appeared to be prescribed by an inflexible routine and were often too long. Thus in the case of a young primigravida, definite albuminuria was discovered at about the 24th week. The patient was told to report in two weeks, by which time the amount was noted to have increased to "+++", and the blood pressure to have risen to 180/100 with accompanying gross oedema. On admission to hospital the first eclamptic fit occurred. The remark was noted on the form that more frequent ante-natal examinations were not advised at this period of pregnancy. In the case of another woman routine, and too infrequent observations both by midwife and doctor continued while the condition of pre-eclampsia became so established that "a neighbour noticing a gross degree of oedema" (the woman herself having observed the small quantity of urine she passed), advised that a visit to her doctor was necessary before the appointed date. Routine is devised for normal cases, and it is no longer suitable when an abnormality arises necessitating more frequent observation. In domiciliary care it is wiser to refer such cases to hospital than to rely on home care.

Hospital ante-natal care proved deficient in another group of cases. One patient was admitted and discharged no less than four times for observation and treatment of headache, vomiting, hypertension and albuminuria. Latterly the blood pressure had not fallen below 150/100. Shortly after her fourth discharge eclampsia supervened. In at least five other patients exactly the same type of fault occurred, in that the symptoms and signs of advanced pre-eclampsia led to the patient being sent home to rest and, perhaps what is worse, not being given a date on which to attend for further examination. In none of the cases was there evidence that arrangements had been made for the patient to be visited at home. On only one record could any reference be found to difficulties owing to shortage of beds, and on this occasion it was implied rather than stated. It would be difficult to say whether the shortage of beds contributed indirectly to the death of these women.

Inadequate ante-natal care by the midwife was apparent only once and by a Local Health Authority Clinic only three times. On each occasion advice was given to a woman found to be suffering from pre-eclamptic toxæmia that she should "go home to bed." Inquiry failed to produce any evidence that steps were taken to ensure further medical care and observation.

### *Confusion of Responsibility*

Confusion of responsibility would appear to have constituted either the sole avoidable factor, or to have contributed largely, to the death of the woman in at least twelve instances.

When arrangements had been made for the confinement to take place in hospital, the responsibility for pre-natal care was almost always that of the hospital. Similarly, when arrangements had been made for the confinement to take place at a maternity home, or in the patient's own home, the responsibility for pre-natal care was almost always that of the general practitioner. In both these groups, however, confusion of responsibility will be seen to have arisen, for in both ante-natal care may have been shared with midwives and Local Health Authority Clinics and as soon as this happened the issue of responsibility seems to have been confused or even ignored.

Owing to lack of simple liaison between a Local Health Authority Clinic and a hospital, a patient expecting her eighth baby and reluctant to enter hospital was able to arrange for her confinement at her own home.

In another, aet 35 and a primigravida, the responsibility early in pregnancy fell between her own doctor, a hospital and a Consultant. Eventually no one did anything, and the patient's doctor was summoned only when she became acutely ill.

Another source of confusion can be illustrated by the following case. The confinement of a patient aet 35 expecting her fourth baby was unwisely arranged at her own home. The initial co-ordination between the midwife and the doctor was poor. The woman developed hyperemesis gravidarum and eventually was sent to hospital. On her discharge from hospital she was under the care of the midwife for 13 consecutive weeks before being referred to her doctor; this was toward the end of her pregnancy.

At times several departments or individuals could be assumed to undertake concurrent responsibility. In one case this was shared between doctor, consultant and hospital.

All the cases under this heading fall more or less into one of the above patterns, and their description has been given solely in the hope that the potential dangers of divided responsibility may be appreciated and therefore avoided in the future.

In some cases arranging for home confinement or in a small maternity home was unwise and that it contributed largely to the patient's death would appear to be certain.

Examples of some of those are given below:—

	<i>Parity*</i>	<i>Age</i>	<i>Comments</i>
(1)	14	42	"A very tired woman," otherwise no comment.
(2)	8	43	"A very tired woman," otherwise no comment.
(3)	2	40	Previous forceps delivery.
(4)	7	37	Previous pre-eclamptic toxæmia.
(5)	9	39	No comment.

To arrange that any of the above cases should be confined in their own home must be regarded as an error of judgment and an avoidable factor which could contribute to the fatal issue.

### *The Follow-up of Ante-natal Patients*

Once more, attention is directed to the absolute necessity for a clear line of action to be followed whenever patients fail to attend their appointment for

\* See footnote on page 4.

ante-natal examination. On several occasions no follow-up was carried out and the patients' non-attendance must have contributed largely to their deaths. No case has been included under this heading where any hint was made on the record that failure to attend was due to ignorance or difficulty on the part of the patients. Otherwise the number of cases would be quadrupled.

All cases in this group are those where the pre-natal care was the responsibility of a hospital or a Local Health Authority Clinic. No evidence was found that any attempt had been made to urge the necessity of attendance on the women, apart from one case which noted "a card was sent." Thus one young primigravida at 20 weeks booked for her confinement in hospital was noted at the Local Health Authority Clinic to have developed "gross oedema." The blood pressure was normal and albuminuria was absent. She was sent "home to rest." Some weeks later she was admitted to hospital as an emergency in eclampsia. Other cases were exactly similar.

### *The Patient's Attitude*

That the patient, often encouraged by her husband or relatives, was solely responsible, was apparent on at least 15 occasions. One half of these women had made no attempt to arrange for their care during pregnancy or in their confinement. In some, the pregnancy was intentionally concealed; while in others the patient stated she had been too busy. This occurred in the case of one woman who was repeatedly visited by a health visitor, and who obstinately refused to accept the advice offered. Others failed time and again to keep appointments made for ante-natal visits and several others flatly refused to agree to go to hospital in spite of what were certainly urgent and sympathetic requests by their doctors and midwives. All but two of these women were multiparae, often grand multiparae. Perhaps the primary fault lay in the initial mistake that was made in agreeing to a home confinement, though in the last resort the doctor and midwife may well have had to make the best of a bad job.

## SUMMARY AND CONCLUSIONS

The following conclusions can be drawn from the foregoing consideration of the deaths from toxæmia.

1. In the present series, this condition has retained its unenviable position as the most important cause today of death in childbirth.
2. The proportion of cases of avoidable factors has risen from 52 per cent. in the 1952-1954 series to 54.8 per cent. in the present series although the actual number of deaths with avoidable factors has fallen.
3. Faulty ante-natal care is by far the most serious and most frequent avoidable factor and the faults recorded in this series would be regarded by most doctors as inexcusable in these days.
4. Greater emphasis and wider appreciation must be given to the vital importance of selection of cases for hospital confinement. No doctor or midwife should ever willingly agree to confinement out of hospital for women in the older age groups, who may have borne more than four children previously,

and especially when previous pregnancies had been complicated by pre-eclamptic toxæmia.

5. That some patients themselves continue to provide avoidable factors, usually by failure to consult their doctor or midwife or rejecting the advice given, points to the need for continued and more emphatic education.
6. Confusion of responsibility between doctor, midwife, clinic and hospital again contributed to the death of a number of patients. This again emphasises the need for better co-operation.
7. Wherever and by whomsoever ante-natal care is given, the necessity for an immediate and personal follow-up of every patient who fails to keep her appointment is as great as ever.
8. Shortage of hospital beds did not seem to provide an avoidable factor in this series, but it would not be possible to say whether indirectly it contributed to the death of these women.



### 3. HAEMORRHAGE

The cases considered in this section of the report are those shown in the International Classification (Appendix, Tables 1 and 2) under the headings numbered 643, 670, 671 and 672, except that three deaths classed to post partum haemorrhage (672) following Caesarean section have been excluded. As in the report for the previous three years when there were 14 such cases, they have not been included because such haemorrhage may be regarded as a post-operative complication rather than as post-partum haemorrhage in the usually accepted sense.

In all, 138 cases have been considered compared with 220 cases in the 1952-54 series. The following table shows the number of deaths in each clinical group and the number in which avoidable factors were considered to be present. Examination of the Registrar-General's returns suggests that it is unlikely that the number of deaths missing from this enquiry affects the conclusions in this chapter.

*Table III. Number of deaths in each clinical group and the number in which avoidable factors were considered to be present*

	Number of Deaths	Deaths with Avoidable Factors	
		Number	Per cent.
Accidental haemorrhage, toxæmic and non-toxæmic .. .. .	40	23	57.5
Placenta prævia .. .. .	28	12	42.9
Post-partum haemorrhage with retained placenta .. .. .	24	14	58.3
Other post-partum haemorrhage ..	46	23	50.0
Total .. .. .	138	72	52.2

## AGE

Table IV. Age distribution among deaths due to haemorrhage compared with the distribution among all births 1955-1957

Age	Accidental Haemorrhage		Placenta Praevia		P.P.H.		All Cases		Total Registered Births
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	Per cent.
Under 20	—	—	—	—	5	7.1	5	3.6	5.4
20-24..	5	12.5	1	3.6	12	17.1	18	13.0	29.0
25-29..	10	25.0	8	28.6	19	27.1	37	26.8	31.7
30-34..	10	25.0	6	21.4	12	17.1	28	20.3	20.4
35-39..	11	27.5	7	25.0	16	22.9	34	24.6	10.2
40 + ..	4	10.0	6	21.4	6	8.6	16	11.6	3.2
Total	40	100.0	28	100.0	70	99.9	138	99.9	99.9

The Table IV shows that the risk of death from haemorrhage is greater in older than in younger women. The trend is apparent from the age of 35 and is strongly marked in the case of placenta praevia.

Table V. Parity distribution among all deaths due to haemorrhage compared with the distribution among all legitimate births 1955-1957

Parity	Accidental Haemorrhage		Placenta Praevia		P.P.H.		All Cases		Registered legitimate live births
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	Per cent.
1 ..	7	17.5	3	11.1	33	47.8	43	31.6	40.0
2 ..	7	17.5	7	25.9	13	18.8	27	19.9	29.8
3 ..	8	20.0	8	29.6	7	10.2	23	16.9	15.1
4 ..	6	15.0	3	11.1	5	7.2	14	10.3	7.3
5 ..	1	2.5	2	7.4	4	5.8	7	5.1	3.7
6 + ..	11	27.5	4	14.8	7	10.2	22	16.2	4.1
Not stated	—	—	1	—	1	—	2	—	—
Total	40	100.0	28	99.9	70	100.0	138	100.0	100.0

Table V again demonstrates the increased risk of death from haemorrhage in the higher parities. For women who have already had five or more (parity 6 +), the risk is four times greater than among all registered births.

## PRE-EXISTING ANAEMIA

The importance of iron deficiency during pregnancy has been emphasised during recent years, and while it is difficult to prove that pre-existing anaemia increases the risk of childbirth, this is a fair assumption to make.

There can be few women in this country for whom haemoglobin estimations cannot be provided, yet in only 39 of the 138 deaths from haemorrhage was there a record of even one haemoglobin estimation. In the majority of cases a full transcript of the ante-natal notes was available, and in nearly all the results of tests for syphilis, blood groups and rhesus factor were recorded. It is likely that the haemoglobin was estimated in some cases, but it is difficult to believe that haemoglobin estimations were made as an essential part of pre-natal care in most cases and yet remained unrecorded.

## ACCIDENTAL HAEMORRHAGE

Accidental haemorrhage may arise as a complication of pre-eclamptic toxæmia and the patient may die from toxæmia or from haemorrhage. It can occur, however, in women with no signs of toxæmia. All cases in which a material amount of accidental haemorrhage occurred have been analysed and divided into three groups.

GROUP A. Cases of toxæmia with accidental haemorrhage in which the actual cause of death was eclampsia or other complication of toxæmia excluding uterine haemorrhage. These were 21 in number and have been included among the toxæmia cases.

GROUP B. Cases of accidental haemorrhage in women with toxæmia in which the cause of death was the haemorrhage. There were 17 such cases.

GROUP C. Cases of accidental haemorrhage with no evidence of pre-existing toxæmia. There were 23 deaths.

The total number of deaths which were directly due to accidental haemorrhage is therefore 40 as shown in Tables III, IV and V.

### *GROUP A. Toxæmia cases which also had accidental haemorrhage*

In all there were 21 cases where toxæmia was considered to be the primary cause of death, but where ante-partum haemorrhage was a contributory factor.

Of the five unavoidable and two doubtful cases, four were booked for hospital confinement, two for home, and for one no arrangements were made. Of the 14 cases with avoidable factors four were booked for hospital confinement, one for a general practitioner maternity unit, one for a private nursing home, seven for home confinement, and in one case no arrangements were made. The avoidable factors were not, of course, always attributable to these services.

Among these deaths, the main avoidable factor was poor ante-natal care, though, in one instance only, poor care during labour was noted as well. In a few cases poor ante-natal care included the non-follow up of patients who did not attend a clinic. Here, of course, the patient or relative was also at fault. In two instances lack of co-operation between several people all undertaking ante-natal care was a contributory factor in the deaths.

In 6 of these 21 cases there is a record of haemoglobin estimation during pregnancy.

The age and parity distribution shows that, in this series, ten women or 47.6 per cent. were under 30 years of age and 11 or 52.4 per cent. were of

30 years and over, compared with 66.1 per cent. and 33.9 per cent. respectively for all births. Seven women were primigravidae, 11 were having their second or third baby and of the remainder one was having her fourth, one her fifth and one her eighth baby.

#### GROUP B. *Accidental haemorrhage with toxæmia*

In 17 cases ante-partum haemorrhage was the major cause of death among patients who also had toxæmia, and of these 13 were considered to have avoidable factors and four unavoidable. Eight cases were booked for hospital confinement, six for home confinement, two for general practitioner maternity units and in one no arrangements had been made.

Among hospital cases which had avoidable factors inadequate ante-natal care with too long intervals between appointments or too early discharge from hospital was considered to have contributed to the patients' deaths, as was delay in blood transfusion in one case.

For domiciliary cases, unwise booking for home confinement, inadequate or poor ante-natal care and failure to refer early enough for consultant advice, all played a part in causing the patient's death.

Lack of co-ordination and co-operation between the persons undertaking the care of the patient was again of importance.

In only 4 of the 17 cases was there a record of haemoglobin estimation during pregnancy.

Of these cases nine women died from shock and haemorrhage and eight died from anuria.

Of all the women in this group six (35.3 per cent.) were under 30 years of age and 11 (64.7 per cent.) were 30 years and over. Four women were primigravidae, three were having their second or third baby and of the remainder, two were having their fourth, three their fifth, one her sixth, two their seventh, one her eighth and one her ninth baby.

#### GROUP C. *Accidental haemorrhage without toxæmia*

There were 23 deaths from accidental ante-partum haemorrhage, of which 11 cases were unavoidable, two doubtful and ten were considered to have avoidable factors. Of these ten cases one was booked for hospital confinement, one was booked for a private nursing home under a general practitioner obstetrician, seven were booked for home confinement, and one patient had made no arrangements.

The avoidable factors among those booked for hospital confinement were inadequate ante-natal care and sending a junior officer in charge of a flying squad. In domiciliary care, unwise booking for home confinement, and inadequate ante-natal care with failure to refer early enough for consultant advice were again of importance, as also was either failure to call the flying squad or to summon it early enough.

Fourteen of the 23 cases of accidental haemorrhage without toxæmia died from shock and haemorrhage and nine died from anuria. In 18 patients, an

ante-natal examination shortly before death excluded toxæmia; and in the remaining five cases, although there had been no recent examination, there was no evidence to suggest pre-existing toxæmia. In two women fatal concealed hæmorrhage occurred before viability—one at 16 and one at 20 weeks. Four cases in this group were delivered by Caesarean Section. No cases in Group A and B were so delivered.

There was a record of hæmoglobin estimations during pregnancy in only six cases out of the 23.

Among the 23 cases, nine (39.1 per cent.) were under 30 years of age and 14 (60.9 per cent.) over 30. Four women were primigravidae, nine were having their second or third baby, and of the remainder, three were having their fourth, one her fifth, one her sixth, two their seventh, one her ninth and two their tenth baby.

## PLACENTA PRAEVIA

There were 28 deaths from placenta prævia with avoidable factors present in 12 (43 per cent.) compared with 16 (55 per cent.) out of 29 deaths in the 1952-1954 series. Twenty-seven patients died in hospital and the remaining woman died at home because she was too ill to be moved. Eighteen cases were delivered by Caesarian Section, one by forceps and nine died undelivered.

### *Avoidable Factors*

Of the 12 deaths with avoidable factors, four were booked for hospital confinement, five for care at home. In two cases no arrangements were made and in one the booking was not stated. Of the hospital cases two were discharged after admission for warning hæmorrhages, and in one of these neither doctor nor midwife was notified that the patient had left hospital. The responsibility for two women was left to comparatively junior registrars, and a consultant failed to admit another patient until too late. Among the domiciliary cases, a local authority medical officer did not send an obviously ill patient to hospital, with the result that she had a severe hæmorrhage a few hours later at home. In another case a midwife omitted to send for the flying squad at once and waited for the general practitioner to be found. In four cases the patient herself was at fault by refusing to stay in hospital, or to see a doctor, and in one instance, failing to seek any professional advice. One of these deaths might have been prevented had the doctor sent for the flying squad instead of sending the patient to hospital. In this series, a warning hæmorrhage was ignored only once and that by the patient herself. She failed to report a small hæmorrhage because she did not want to go to hospital.

Booking for home instead of hospital confinement probably contributed to the death of one woman having her sixth, one her ninth and one her eleventh baby.

Only in six of the 28 cases is there a record of hæmoglobin estimation during pregnancy.

The age and parity of the women in this group are given in Tables IV and V.

## POST-PARTUM HAEMORRHAGE

### *Post-partum haemorrhage with retained placenta*

All the deaths in this series were due to haemorrhage. Compared with the 1952-1954 report, the number of cases in this group is less than half and the number with avoidable factors less than one third of those so classified in the previous series. This substantial fall can only mean that the standard of management of the third stage has improved and probably that greater use has been made of the "flying squads." The increasing use of ergometrine as a prophylactic against the occurrence of haemorrhage may also have played a part.

In 1952-1954, 53 deaths occurred of which 47 (89 per cent.) had avoidable factors, whereas in 1955-1957 only 24 deaths occurred of which 14 (58 per cent.) had avoidable factors.

### *Avoidable Factors*

There were seven cases in which the mistake was to send a patient into hospital instead of sending for the flying squad: this can be compared with 21 cases in the previous series. Manual removal of the placenta was delayed in two instances until the patient had lost far too much blood. There was undue delay in sending for the flying squad for two women who died in maternity homes. At the patient's home in one case, a midwife sent for the doctor instead of the flying squad, and in several other cases there was unnecessary delay in starting a transfusion. In one case in which a haemoglobin estimation during pregnancy showed 40 per cent. haemoglobin, no treatment was given beyond oral iron. Although she was booked for a maternity home, through the apathy of the patient and her relatives the baby was born at home. A profuse haemorrhage followed before anyone was called. The doctor sent the patient into hospital with the placenta retained and she arrived moribund.

Another case is worth quoting as showing several unfortunate incidents, no one of which could be held responsible for the death. A young primigravida developed toxæmia and refused to go to hospital. She was successfully delivered of a live child but the placenta was retained. The doctor telephoned the consultant who, instead of visiting the patient, gave instructions that she was to be sent to a small hospital some ten miles away. The patient arrived at the hospital in good condition and manual removal of the placenta was carried out at once. The loss of blood does not appear to have been excessive, but the patient became shocked after the operation. It was not until this occurred that steps were taken to obtain suitable blood for transfusion, and it was six hours before transfusion could be started; by then shock had become irreversible. Death might have been avoided by delaying the manual removal until a supply of blood was available.

There were five deaths of women who had had four or more children, but only one of these had been booked for home confinement, and efforts had been made throughout pregnancy to persuade her to accept a hospital booking.

In this series there was no mention of difficulties in securing the services of flying squads or in obtaining hospital beds.

Of the 24 cases with retained placenta, in only ten was there a record of haemoglobin estimation during pregnancy.

Thirteen (54.1 per cent.) of the women among these 24 cases were under the age of 30, and 11 (45.8 per cent.) were 30 years or over. Nine of the women were primigravidae, nine were having their second or third baby; one her fourth; two their fifth; one her seventh; one her eighth; and one her eleventh baby.

#### *Post-partum haemorrhage not associated with retained placenta*

In this series there were 46 deaths from post-partum haemorrhage after the delivery of the placenta. This compares with 60 deaths in the 1952-1954 series. Although the fall is large it is not as striking as in the case of haemorrhage with retained placenta. Avoidable factors were present in 23 cases (50 per cent.) in this series compared with 33 (55 per cent.) in the previous series.

#### *The Avoidable Factors*

Two women were found dead. In neither case had they reported the pregnancy to anyone and they alone were responsible for their own deaths. Of the remaining 21 women, nine were delivered at home, seven in hospital and five in maternity homes.

Among those cases with avoidable factors who were booked for home confinements were the following: two cases, both having their third babies, with bad obstetric histories who should have been booked for hospital from the beginning; one woman having her fourth baby, who should have been referred to hospital for confinement because of an ante-partum haemorrhage; and a woman having her fifth baby who not only should not have been accepted for home confinement from the beginning, but also should have had the booking changed when she was found to have a twin pregnancy.

Two women with twins who should have been booked for hospital confinement were delivered in maternity homes and in one the labour was mismanaged. In four of the five cases delivered in maternity homes the serious condition of the patients was not realised until too late, thus resulting in delay in obtaining blood. In one fatal case, in which pituitary extract was administered during labour, rupture of the uterus may have occurred.

In two cases where labour took place in hospital, a junior medical officer failed to send for the consultant when in difficulty. Three deaths were due to delay in blood transfusion, while failure to transfuse one anaemic woman before labour contributed to her death. In one case the management of severe post-partum haemorrhage was unwise, and in another where an atonic post-partum haemorrhage occurred, the second stage of labour was allowed to go on for too long. It is of interest to note that all the women who had four or more children were booked for hospital confinement, except one who had had four previous normal confinements.

In 12 of the 46 deaths haemoglobin estimations were recorded in the antenatal period.

Half the women in this group were under 30 years of age. Twenty-four were primigravidae, 11 were expecting their second or third baby; four their fourth; two their fifth; one her sixth; one her seventh; one her eighth; one her tenth baby; and in the remaining case the information was not recorded.

## SUMMARY AND CONCLUSIONS

1. There were 138 deaths from haemorrhage, of which 72 (52.2 per cent.) had avoidable factors. This compares with 220 deaths in 1952 to 1954, of which 135 (61.4 per cent.) had avoidable factors.
2. There has been a remarkable drop in the number of deaths from post-partum haemorrhage with retained placenta, and a large but less impressive fall in the number of deaths from other post-partum haemorrhage. This is probably due to an improved standard of management of the third stage of labour and greater use of the flying squads. The increasing use of ergometrine as a prophylactic against the occurrence of haemorrhage may well have played a part.
3. In only 39 out of 138 deaths from haemorrhage was a haemoglobin estimation recorded. The importance of the diagnosis and treatment of pre-existing anaemia is stressed.
4. Lack of appreciation of the seriousness of the condition still remains the primary avoidable factor in cases of haemorrhage. In hospital blood transfusions were not started early enough and junior medical officers failed to obtain consultant help. In domiciliary practice there was delay in summoning flying squads, sometimes because the midwife attempted to summon the doctor first.
5. Failure to select for hospital confinement the grand multiparae or cases with previous histories of third stage complications and multiple pregnancies is still a contributory factor in the death of these patients.



## 4. PULMONARY EMBOLISM

The cases considered in this section are those shown in the International Statistical Classification (Appendix Tables 1 and 2) under rubric No. 465, where the embolism was considered to be associated with and not due to pregnancy, to No. 648 (other complications arising from pregnancy) where the embolism was considered to be directly due to pregnancy, and No. 684 where the embolism occurred during labour or the puerperium. All cases of puerperal pulmonary embolism following puerperal phlebitis and thrombosis have been classified under rubric No. 684. As in the last report, where the patient was dying from some other cause and the embolism was the final incident, death has been ascribed to the actual cause of death—thus although pulmonary embolism was the immediate cause of death in 33 cases of Caesarean Section (see Chapter 7) seven cases have been excluded from this chapter as it was considered to be the terminal event and not the true cause of death.

During 1952–1954, 138 cases were described as due to pulmonary embolism and this has risen to 147 cases in this series. In addition there are a further ten cases which are considered to be associated with pregnancy. The increase is partly accounted for by the larger number of births during this second period and possibly partly by slight variations in classification. It is therefore doubtful if there has been a significant rise in the number of deaths from pulmonary embolism.

The 157 cases were distributed as follows:—

- |  |                        |
|--|------------------------|
| (i) Deaths during pregnancy .. ..              | 17 (4 in 1952–1954)    |
| (ii) Deaths following vaginal delivery .. ..   | 114 (104 in 1952–1954) |
| (iii) Deaths following Caesarean Section .. .. | 26 (30 in 1952–1954)   |

### *Deaths during pregnancy*

The 17 cases where death occurred during pregnancy present no consistent pattern. The duration of pregnancy varied from eight weeks to term; the age from 21 to 45; and the parity from 1 to 9. The average age was 35 and seven out of the 17 deaths occurred during a second pregnancy. Two women had a record of previous thrombosis during pregnancy, and seven others were noted as having thrombosis or varicose veins present before the fatal embolism. In the remaining ten cases it was not suspected; three were apparently healthy women and the diagnosis was confirmed post-mortem; the source of the clot was not found in two; and in the remainder unsuspected femoral thrombosis was found at autopsy.

Death occurred during the treatment of mild anaemia in one patient and this is the only occasion where anaemia is mentioned in this group. Other deaths followed laparotomy for adhesions (1); haemorrhoidectomy when the presence of an early pregnancy was only found at autopsy (1); attempted abortion (1); during treatment for toxæmia (1); diabetes (1); and bronchitis (1).

### *Deaths following vaginal delivery*

There were 114 cases in this group.

In 48 there was no clinical reason to expect embolism, compared with 37 in the 1952-1954 series. Seven women had mild pyrexia and six were suffering from anaemia. The records do not provide enough information to determine the relationship between ambulation and the occurrence of the embolism, but it is clear that the majority were walking about and a number had resumed normal duties when the embolism occurred.

Because of either a venous thrombosis or a warning embolism prior to the fatal one the possibility of a pulmonary embolism was anticipated in 46 cases compared with 51 in the 1952-1954 series. Most were under treatment and some were considered to be cured. Eleven women had pyrexia and eight were suffering from anaemia.

*Table VI. Onset of fatal embolism*

The figures in brackets are the number of cases confirmed by post-mortem examination.

Days after Delivery	Cases with no Warning		Suspected Cases	
Under 24 hours .. ..	6	(4)	—	—
2- 7 days .. ..	13	(11)	5	(3)
8-14 days .. ..	15	(13)	8	(3)
15-28 days .. ..	9	(6)	24	(12)
Over 28 days .. ..	5	(5)	9	(5)
Total .. ..	48	(39)	46	(23)

Table VI refers to the two first groups and shows the number of days after delivery when the fatal embolism occurred. It can be seen that in the group with clinical evidence of thrombosis under 30 per cent. died within two weeks of delivery, while in those without evidence of thrombosis 70 per cent. died during this period.

In six cases the embolism followed surgical operations which took place during the puerperium; two were for sterilisation on the eighth and twelfth days after delivery respectively; one following a repair of prolapse two days after delivery; one following curettage for persistent bleeding; one following hysterotomy and one following laparotomy for spontaneous retroperitoneal haemorrhage. It is at least reasonable to suggest that some of these procedures might have been postponed.

The remaining 14 women were seriously ill mainly on account of pulmonary disease. It is impossible to assess the part played by recent delivery in causing the venous thrombosis which produced the emboli.

### *Deaths following Caesarean Section*

Twenty-six deaths from pulmonary embolism following Caesarean Section are considered to be appropriate to this portion of the report. In only two cases was thrombosis recorded. Death occurred within 24 hours of the operation in

one case, within 2 to 7 days in seven cases, between 8 and 14 days in eleven cases; between 15 and 28 days in five cases, and on the 32nd day in the remaining case.

### *Anticoagulant Therapy*

Anticoagulants were used in one case of thrombophlebitis during pregnancy and in seven out of 46 cases where thrombosis was diagnosed after delivery or a warning embolism occurred. In the 1952-1954 series ten cases were so treated. In neither series is there any report of haemorrhage due to the treatment.

### *Anaemia*

In 33 of the 140 cases where death occurred after delivery there was a record of one or more haemoglobin estimations during pregnancy. In 19 out of the 140 there was evidence of anaemia, either a low haemoglobin being recorded or a statement made that the patient appeared anaemic.

### *Age and Parity*

*Table VII. Age distribution of deaths from pulmonary embolism compared with all registered births*

Age	Deaths from Pulmonary Embolism		Total Registered Births
	No.	Per Cent.	Per Cent.
Under 20 ..	2	1.3	5.4
20-24 .. ..	22	14.0	29.0
25-29 .. ..	44	28.0	31.7
30-34 .. ..	29	18.5	20.4
35-39 .. ..	44	28.0	10.2
40+ .. ..	16	10.2	3.2
Total ..	157	100.0	99.9

*Table VIII. Parity distribution among deaths from pulmonary embolism compared with all registered births*

Parity	Deaths from Pulmonary Embolism		Registered Legitimate Live Births
	No.	Per Cent.	Per Cent.
1. .. ..	47	29.9	40.0
2. .. ..	43	27.4	29.8
3. .. ..	27	17.2	15.1
4. .. ..	21	13.4	7.3
5. .. ..	5	3.2	3.7
6+ .. ..	14	8.9	4.1
Total ..	157	100.0	100.0

These tables show very much the same pattern as in the 1952-1954 series. Relative to the number of parturient women in the different age and parity groups, pulmonary embolism is more frequent over the age of 30 years and in the higher than the lower parities.

#### *Avoidable Factors*

Avoidable factors were considered to be present in 14 of the 140 cases which occurred after delivery, but the figure is of little significance for the avoidable factor often related to the management of predisposing conditions.

## SUMMARY AND CONCLUSIONS

1. Death was caused by pulmonary embolism in 157 cases of which 17 occurred during pregnancy, 114 followed vaginal delivery and 26 followed Caesarian Section.
2. In those cases where a thrombosis or other warning sign was detected death occurred less commonly within 14 days of delivery than when the thrombosis was unsuspected.
3. Haemoglobin estimations during pregnancy were recorded in 33 out of 140 cases and there was evidence of anaemia in only 19.

## 5. ABORTION

In the present series death occurred from abortion on 141 occasions compared with 153 in the 1952-1954 enquiry. However, analysis of the deaths missing from both enquiries but registered as maternal deaths by the Registrar General showed a high proportion due to abortion. It is not therefore possible to draw any conclusions by comparing the actual number of deaths in the two series. When abortion occurred, or was therapeutically induced, in the course of, for instance, pre-eclamptic toxæmia or heart disease, the death has been classed under the originating condition.

In 91 cases the death was regarded as avoidable in that the abortion was known to have been procured by the woman herself in 40 instances, by some other person on 20 occasions, and in the remaining cases it was uncertain by whom the abortion was procured. The proportion of married women in this group was 58 per cent. and single women 38 per cent. In 3 per cent. the status of the woman was not recorded.

With only three exceptions the circumstances of the unmarried women who died following procured abortion was noted to be "comfortable."

*Table IX. Parity distribution of deaths from abortion according to marital status*

Parity	Married	Single
1	6	26
2	11	7
3	15	—
4	5	1
5	9	1
6	2	—
7	3	—
8	1	—
9	1	—
—	53	35

As before, some of the married women were mothers of a large family, and notes are actually made on some of the forms that the women probably took steps to end her pregnancy because she was worried lest the added burden of another child would lessen her care of the existing family. Most of the women were noted to be living under great financial difficulties. Nevertheless, in two-thirds of the married women the fatal pregnancy would have brought a family up to four or less and in six cases there were no children. The desire to avoid a very large family is thus not the main motive in these cases.

An analysis of the age groups of the patients is given in Table X.

Table X. Procured abortion by Age

	Number *	Percentage	Percentage Distribution all Registered Births
Under 20 .. ..	5	5.6	5.4
20-24 .. ..	16	17.8	29.0
25-29 .. ..	20	22.2	31.7
30-34 .. ..	23	25.6	20.4
35-39 .. ..	19	21.1	10.2
40 + .. ..	7	7.8	3.2
Total ..	90	100.1	99.9

\* One age unknown.

Of the 91 procured abortions, the actual cause of death was sepsis in 47 cases, air embolus in 19 cases, renal cortical necrosis in 11 cases, shock in 8, and the remainder was due to various causes or were unstated. The injection of some fluid, usually soapy water into the vagina was noted to have been employed on 33 occasions, including all the deaths from air embolus. The passage of instruments was recorded on 46 occasions. In the remainder no note was made.

No useful information was obtained from the reports of the abortions which were not procured.

## SUMMARY AND CONCLUSIONS

1. Of the 141 deaths from abortion 91 were recorded as avoidable in that the abortion was procured for non-therapeutic reasons.
2. Of these 91 cases in which the abortion was procured for non-therapeutic reasons this was done by the woman herself on 40 occasions, by some other person in 20, and in the remainder the person responsible was unknown.
3. In 53 of these cases the woman was married.
4. In those cases of procured abortion in which the patient's circumstances were noted in the reports, many of the married women were reported to be living in poor circumstances and some had families of considerable size. Most of the single women were recorded as living in comfortable circumstances.
5. Death from air embolus was always preceded by a method of procuring abortion which involved the injection of some fluid under pressure.

## 6. CARDIAC DISEASE ASSOCIATED WITH PREGNANCY

In the present series 102 deaths occurred as the result of cardiac disease which was present as a complication of pregnancy, compared with 121 in the 1952-1954 enquiry.

The items of interest that have arisen are noted below and attention is drawn to the relatively high incidence of Caesarean Section in the present series.

### *Age*

Table XI shows the age distribution among deaths due to cardiac disease compared with the distribution among all registered births. Much the same picture is presented as in the last series though the influence of age is even more marked. Thus in the 1952-1954 series of deaths the proportion of women over 40 years of age was under twice the proportion of all parturient women in that age group, whereas in the present series it is about five times as great. It has to be noted, however, that the numbers are small.

*Table XI. Age distribution of deaths from Cardiac Disease*

Age	Deaths from Cardiac Disease		Total Registered Births
	Number	Percentage	Percentage
Under 20 ..	2	2.0	5.4
20-24 .. ..	13	12.7	29.0
25-29 .. ..	22	21.6	31.7
30-34 .. ..	25	24.5	20.4
35-39 .. ..	23	22.5	10.2
40 + .. ..	17	16.7	3.2
Total ..	102	100.0	99.9

As before, the added risk of pregnancy complicating valvular disease of the heart becomes apparent over the age of 30. That such chronic valvular diseases of the heart must be regarded as producing progressive cardiac disability does not appear to be appreciated by all and further reference is made to this point later on.

### *Parity*

Table XII shows the distribution of parity among deaths due to cardiac disease compared with the distribution among all registered legitimate births in 1955-1957.

Table XII. Distribution of Parity among Deaths due to Cardiac Disease

Parity	Deaths from Cardiac Disease		Registered Legitimate Live Births Percentage
	Number	Percentage	
1.. ..	39	38.2	40.0
2.. ..	22	21.6	29.8
3.. ..	15	14.7	15.1
4.. ..	9	8.8	7.3
5.. ..	4	3.9	3.7
6+ ..	13	12.7	4.1
Total ..	102	99.9	100.0

There has been a change in the distribution according to parity compared with the previous series. Although in 1952-1954, 50.4 per cent. of the deaths from cardiac disease were first pregnancies, and this was a higher proportion compared with all legitimate births, in the present series the proportion is slightly lower, 38.2 per cent. This fall might reflect the decline in the incidence of rheumatic fever during the last 20 years. The proportion of deaths among the fourth and higher parities remains greater than the general distribution.

#### *Nature of the Cardiac Lesion*

There is some difference from the previous report in classification of the nature of the lesion. In 69 out of a total of 102 cases, the diagnosis was made as a result of observations made at post-mortem examination. Concurrent disease of the aortic valve which had remained undiagnosed during life was often noted in cases with known mitral disease. Where no post-mortem examination was made, the death was nearly always recorded as due to mitral valve disease.

The nature of the cardiac lesion in the 102 cases was as follows:—

Rheumatic Heart Disease (including mitral and aortic valve disease)	..	..	..	..	89
Disease of the coronary artery	..	..	..	..	5
Bacterial endocarditis..	..	..	..	..	5
Others ..	..	..	..	..	3
TOTAL	..	..	..	..	102

#### *Time of Death in Relation to Confinement*

Table XIII. Time of Death in Relation to Confinement

	Number	Percentage
Died in pregnancy .. .. .	51	50.0
Died in labour .. .. .	14	13.7
Died within 24 hours of completion of labour ..	10	9.8
Died in puerperium (excluding the first 24 hours)	18	17.6
Died following Caesarean Section .. ..	9	8.8
Total .. .. .	102	99.9



From Table XIII it can be seen that 50 per cent. (33 per cent.) of all deaths occurred during pregnancy, 32 per cent. (40 per cent.) during or immediately following labour, and 18 per cent. (27 per cent.) during the puerperium. The figures in brackets refer to the findings in the 1952-1954 series.

That death from acute failure is likely to occur at any time in pregnancy and not during any particular month is shown in the following table:

<i>Duration of pregnancy</i>		1955-57	1952-54
16-19 weeks	.. ..	9	4
20-23 "	.. ..	8	6
24-27 "	.. ..	9	7
28-31 "	.. ..	9	9
32-35 "	.. ..	9	7
36-39 "	.. ..	7	7
		—	—
		51	40
		—	—

An avoidable factor was found in one out of every three cases when death occurred during pregnancy, but during labour or immediately afterwards two out of every three women had an avoidable factor.

#### *Treatment of Heart Disease in Pregnancy*

There is no recorded case of death occurring at the time of or following hysterotomy, but it was noted that in the present series five women had been told that this procedure was advisable and for various reasons had refused permission. In three other instances an operation for sterilisation had been suggested and had been refused.

Valvotomy was performed three times during pregnancy and seven women had undergone the operation prior to their pregnancy. The increase in deaths compared with the previous report is doubtless associated with the greater frequency of the operation.

In the preceding report no instance of death was recorded when Caesarean Section had been performed in a patient suffering from cardiac disease, but in the present series death occurred at the time of or immediately following the performance of this operation on no fewer than seven occasions. Note must be made of the doubtful wisdom of the performance of Caesarean Section for a woman suffering from known cardiac disease solely in order that she might be sterilised as appears to have been done in one case. In two other cases the operation was considered necessary for maternal distress, in one case for foetal distress, and in another case for a breech presentation in a woman who had delivered herself easily and naturally of five babies previously. Of the two remaining cases, one patient was suffering from pre-eclamptic toxæmia and ante-partum hæmorrhage, and the other died of heart failure a few days after the operation.

While it is not known whether the frequency of Caesarean Section in cardiac disease is increasing, this information does appear to confirm what has been accepted for years, namely, that Caesarean Section should be employed in cases of cardiac disease only in exceptional circumstances.

## THE AVOIDABLE FACTORS

Of the 102 cases due to cardiac disease at least 40 were considered to have avoidable factors, giving a percentage of 39 compared with 33 in the 1952-1954 series. On only four occasions was there doubt as to the correct classification, and in all four it would appear that an avoidable factor had been present, but all four were included in the group possessing no avoidable factor as certain necessary evidence was lacking. In every case there was grave doubt as to the adequacy of ante-natal care.

In many cases more than one avoidable factor existed and each must have contributed to the deaths of the women.

### *Deficient Ante-natal Care*

As deficient ante-natal care was judged to be present in no fewer than 20 cases (50 per cent. of the deaths with an avoidable factor) this constitutes by far the most serious avoidable factor. The deficiency was never small, indeed, in every instance it was glaringly obvious. In ten cases pre-natal care was undertaken by a hospital, in the remainder arrangements had been made for the confinement to take place either in the patient's own home (six cases) or in a maternity home (four cases).

In the hospital cases there appeared to be a general lack of appreciation of the seriousness of a past history of rheumatic disease with accompanying symptoms and signs of cardiac involvement. There was no evidence that these patients had additional rest at any time in pregnancy, especially in the weeks preceding the expected onset of labour. In several no advice had been sought from a consultant physician and certainly no use had been made of special means of investigation to assess cardiac function. Patients whose condition was admitted not to be satisfactory were allowed to return home. In two instances this was stated to be necessary owing to shortage of beds, but in neither case was an attempt made to arrange for the progress of the patient to be watched at her home. In two cases ante-natal care of hospital-booked cases was the responsibility of a Local Health Authority Clinic. Subsequent notes made by the medical officers concerned stressed that at no time was any anxiety felt because at no time was any *obstetrical* abnormality detected.

In not one instance of the ten cases whose confinement had been arranged at their home or in maternity homes, had the advice of a consultant physician been sought. No patient had a period of complete rest at any time in her pregnancy.

Other avoidable factors in the pre-natal care of patients in this group are discussed under other headings such as "arrangements for the confinement."

### *The Patient's Attitude*

The patient herself, often supported in her view by relatives or friends, provided the avoidable factor in at least 12 instances (18 in the preceding series). There was ample evidence that her refusal to agree to the advice offered persisted in spite of prolonged and sympathetic efforts on the part of doctors and midwives. Again, some women were naturally anxious not to leave the family and the home. Their impaired state of physical health increased their

very natural worry, for they were in no fit state to have to decide anything. Usually these patients had, most unwisely, been allowed to arrange for their confinement to take place at home, but whether more could have been done to persuade them to go into hospital cannot be said.

#### *Arrangements for the confinement*

Eleven (19 in 1952-1954) women with known valvular disease of the heart had arranged with the consent of their doctor, to be looked after at home or in a maternity home. In every case this unwise arrangement contributed directly and considerably to the fatal result. In most of these cases the woman was a multipara, and on two occasions the doctor in charge actually stated that there was no contra-indication for making plans for the confinement to take place in the patient's home because the previous confinements had been normal. In another case the patient, who was pregnant for the fourth time, had had mitral stenosis with symptoms of marked cardiac embarrassment during her third confinement which had taken place in hospital. In spite of this and, because previously there had been no "obstetrical difficulties," this patient's doctor agreed to a home confinement.

It would appear necessary to emphasise the progressive nature of mitral and aortic valvular disease and of the undoubted strain thrown on a defective heart by each successive pregnancy and labour—and by the increased work in caring for a growing family.

#### *Confusion of responsibility*

The deaths of three women (four in the preceding series) might have been prevented if there had not been confusion of responsibility between hospital, clinic, patient's doctor and midwife. Excellent advice was given by one adviser which, if it had been followed, and if that particular part of the maternity service had been willing and able to supervise the patient's care throughout, might have prevented her death.

#### *Failure to follow up the non-attendance of a patient*

Four deaths might have been prevented if effective action had been taken on the non-appearance of the patient on the date given to her for her next attendance for ante-natal examination. Three of these patients were under hospital care and one attended the ante-natal clinic of a Local Health Authority.

#### *Failure to seek ante-natal care*

In only two instances did the women suffering from cardiac disease fail to seek ante-natal care. In one case the woman was the mother of a large family, and from the record was tired, ill and over-worked. The other was a case of concealed pregnancy.

## SUMMARY AND CONCLUSIONS

1. Of 102 women whose deaths were believed to be due to cardiac disease which was present as a complication of pregnancy, in at least 40 instances, 39·2 per cent., an avoidable factor was considered to be present.
2. In the 62 cases, where no avoidable factor was present, death from sudden acute heart failure occurred more frequently during pregnancy than during labour or in the puerperium. In the group of 40 cases where avoidable factors were thought to be present a higher proportion died during labour.
3. Among the 102 deaths from cardiac disease there were 19 cases which did not receive any hospital care.
4. The danger of the operation of Caesarean Section in pregnant women suffering from cardiac disease would appear to have been confirmed.

## 7. CAESAREAN SECTION

The number of deaths associated with but not necessarily due to Caesarean Section was 184 in this enquiry compared with 183 in the 1952-1954 series.

*Table XIV. Estimated number of Caesarean Sections and the death rate*

	1955	1956	1957
Total births in N.H.S. Hospitals .. .. .	411,700	433,194	448,176
Total births in non N.H.S. Hospital .. .. .	28,146	28,028	27,620
All hospital births .. .. .	439,846	461,222	475,796
Percentage of Caesarean Sections in N.H.S. Hospitals (In-patients sample) .. .. .	3.8	3.9	3.8
Estimated number of Caesarean Sections in all hospital deliveries .. .. .	16,539	18,133	17,950
Total Births, England and Wales .. .. .	683,640	716,740	739,996
Percentage of Caesarean Sections for all births .. .. .	2.4	2.5	2.4
Deaths from Caesarean Sections (true maternal and associated deaths) .. .. .	58	66	60
Estimated number of deaths per 1,000 Caesarean Sections .. .. .	3.5	3.6	3.3

Table XIV shows an estimate of the number of Caesarean Sections performed each year and the death rate based on the assumption that the number of Caesarean Sections per 100 deliveries in N.H.S. hospitals, found from the Hospital In-patient Enquiry conducted by the Ministry of Health and the General Register Office, can be applied to all hospital deliveries. The death rate is a minimum estimate as there was an unknown number of Caesarean Sections among the cases missing from the Enquiry whose inclusion would raise the death rate.

In the last report there was an estimated mortality rate of four per 1,000 Caesarean Sections, but it was based on slightly different calculations, so that the death rates given above cannot be compared with the 1952-1954 report. It can be said, however, that within the three years of the Enquiry the death rate had remained more or less stationary at approximately 3.5 per 1,000 Caesarean Sections.

Consideration will next be given to various findings obtained from scrutiny of the records. In 1952 to 1954, although 183 deaths followed Caesarean Section eight were rejected for various reasons, usually inadequacy of information contained in the reports; for similar reasons in 1955-57, four cases have been rejected, so that in the following analysis only 180 deaths are considered.

### *Immediate Cause of Death*

The following table gives the immediate cause of death in the present series. This list of causes does not correspond with those given in the Appendix Table 1, in which many deaths following shortly after Caesarean Section are classed to the condition for which the operation was undertaken.

*Table XV. Caesarean Sections*  
*Avoidable factors according to the immediate cause of death*

Immediate cause of Death	All Deaths				Death with Avoidable Factors			
	1952-4		1955-7		1952-4		1955-7	
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
Haemorrhage and shock	65	37.1	44	24.4	22	33.8	15	34.1
Pulmonary embolus ..	32	18.3	33	18.3	4	12.5	10	30.3
Sepsis and ileus ..	26	14.9	30	16.7	10	38.5	11	36.7
Valvular disease of the heart ..	6	3.4	15	8.3	—A	—A	4	26.7
Cerebral haemorrhage	—B	—B	10	5.6	—B	—B	1	10.0
* Generalised toxic necrosis ..	—B	—B	11	6.1	—B	—B	7	63.6
Anaesthetic deaths (incl. inhalation of vomit)	12	6.9	11	6.1	5	41.7	4	36.4
Other causes ..	34C	19.4C	26	14.4	11D	27.5D	1	3.8
Total ..	175	100.0	180	99.9	52	29.7	53	29.4

A. Figures are not available for the 1952-1954 report.

B. These figures are included with "other causes" for 1952-1954.

C. Figures marked B are included with this figure.

D. Figures marked A and B are included with this figure.

In nearly every instance the cause of death was determined by the findings at post-mortem examination, together with the clinical notes in the case. In only a very few cases was no post-mortem examination performed. In the present series deaths from haemorrhage and shock have been classed together, as in the majority of cases loss of blood dominated the picture, and for similar reasons sepsis and ileus constitute one group; in fact, death was certified as having been due to "ileus" on only four occasions. There is a considerable fall both in the actual number and the proportion of deaths due to haemorrhage, and an actual and proportionate rise in those deaths due to sepsis. Apart from this the picture is much the same in the two series. The number of women who died from pulmonary embolus remains almost the same, as does the figure of those classed as anaesthetic deaths. Among these latter, however, in only five instances did the patient die as the direct result of the inhalation of vomit. Whereas in many of these cases Caesarean Section was certainly not the cause of death, it would seem that in others the operation was at least a contributory factor. Solely in order that consideration may be given to possible avoidable causes and solely in the hope that this may lead to a further fall in the maternal mortality, the clinical features of some of the cases under this heading will be presented in a manner differing considerably from the previous report.

As an immediate cause of death, haemorrhage and shock remain head of Table XV, though the number has fallen from 65 in 1952-54 to 44 in 1955-57 (37 per cent. to 24 per cent.). The most striking feature in this group is a series of at least ten cases of death from loss of blood when the operation had been

\* Generalised toxic necrosis is a term generally used by pathologists to describe toxæmia of pregnancy.

performed for placenta praevia. In every one of these women the surgeon recorded that at the time of operation large, or huge, blood vessels were seen in the lower uterine segment. That this observation was correct was indeed proved by subsequent events. The diagnosis of placenta praevia had been correctly and accurately made in every case, but in each one of these women a routine transverse incision was made in the lower segment of the uterus with the inevitable result that haemorrhage occurred, variously described as "severe," "very severe," "torrential," "massive." Every effort should be made to improve the general condition of the patient either before she is moved to hospital (and in no instance was there any record of the help of the Emergency Obstetric team having been sought) and/or before she reaches the operation theatre. In several cases no record is made of any previous transfusion, but in others this step was certainly taken (one patient received no less than 40 pints of blood). That the management of what is potentially a most dangerous condition should whenever possible be in the hands of the most experienced and skilled personnel available surely cannot be disputed. Responsibility cannot safely be taken nor directions given by telephone in cases such as these. Similarly, complaints from the consultant that he was "informed too late" are not justified where the delay in notifying him occurred as the result of a faulty organisation in his department.

The operation of Caesarean Section is always accompanied by loss of blood. Were it not for recent advances in anaesthesia, the perfection of blood transfusion, and improvement in surgical technique, the mortality would undoubtedly be much higher. None the less, although the cases under review represent only a small proportion of the number of operations performed in the period, consideration of some of the clinical features may not be entirely valueless.

### *Indications for operation*

In the previous report occur the words "no information is likely to be gained from a breakdown of the indications for operation as it is not possible to obtain a comparable series from the country as a whole." At the same time such a breakdown is always of interest and in order to see whether any particular cause of death was likely to complicate an illness or to follow preceding events the following analysis is presented:—

<i>Indication for Caesarean Section</i>				<i>Cause of Death</i>	
Pre-eclamptic Toxaemia 41 cases	..	..	..	Diffuse Toxic Necrosis	14
				Pulmonary Embolus	7
				Cerebral Haemorrhage	6
				Sepsis	6
				Haemorrhage	4
Uterine Inertia 30 cases	..	..	..	Anaesthetic Deaths	4
				Pulmonary Embolus	10
				Sepsis	9
				Haemorrhage	8
				Anaesthetic Deaths	3
Placenta Praevia 20 cases	..	..	..	Haemorrhage	14
				Sepsis	4
				Pulmonary Embolus	2

<i>Indication for Caesarean Section</i>					<i>Cause of Death</i>		
Obstructed Labour .. .. .	13 cases				Haemorrhage	8	
					Sepsis	2	
					Heart Failure	2	
					Pulmonary Embolus	1	
Disproportion .. .. .	(premeditated operation)	15 cases			Pulmonary Embolus	5	
					Anaesthetic Deaths	4	
					"Ileus"	3	
					Sepsis	1	
					Haemorrhage	1	
Valvular Disease of the Heart or Acute Heart Failure .. .. .					Acute Heart Failure	1	
Failure .. .. .	8 cases					Acute Heart Failure	8

The above findings are self explanatory. Note can be made, however, of the low incidence of death from haemorrhage where the operation is premeditated and in women suffering from pre-eclamptic toxæmia.

Other indications, while fewer in number, are not without interest. Thus the operation was performed because the patient was suffering from malignant disease in the cervix (2), ovary (2), rectum (1), bronchus (1), and uterine sarcoma (1). On three occasions the operation was for concealed ante-partum haemorrhage and all three patients died from loss of blood. Other reasons given were for foetal distress (5), for fibroids (3), for prolapse of the cord (2), and for various general illnesses of the mother, such as aplastic anaemia (2), spinal tumour (1), poliomyelitis (1), and Addison's Disease (1).

What may be termed unusual indications were—"In order to sterilise the patient," the procedure having, according to the notes, been advised by a psychiatrist, and where in the absence of physical abnormality, Caesarean Section was considered to be a safer procedure than a normal delivery.

Three post-mortem Caesarean Sections were performed and one living baby obtained and two living babies were delivered on three occasions when the operation was performed immediately ante-mortem, e.g., when the patient had had a cerebral haemorrhage.

### *Placenta Praevia*

Attention has already been directed to certain aspects of the employment of Caesarean Section in the treatment of placenta praevia. These might be considered to deserve consideration as possible methods whereby the successful treatment of this condition could be improved still further. It is proposed to comment where possible, and in a similar manner, on information that is available in the records of cases of death associated with, but by no means due to Caesarean Section. Each group of indications will be taken in turn.

### *Pre-eclamptic Toxaemia*

Of the 41 cases under this heading, an avoidable factor was considered to be present in only 15 instances. On 12 occasions this lay in the gross inadequacy of the ante-natal care, and in the remaining three cases the patient herself



refused to accept the advice that was offered. (These matters have already been discussed fully elsewhere.) In other words, on no occasion was it thought that the performance of the operation in these cases provided any avoidable factor.

### *Disproportion and Repeat Caesarean Section*

Thirteen women died following an operation performed for disproportion and another 12 following a repeat Caesarean Section. As all these operations were pre-arranged they may be taken together. It is of interest to note the small part played by haemorrhage as a cause of death in these 25 cases. No comment is made in regard to the repeat Caesarean operations, except to state that in the records on several occasions the operation was noted to be technically difficult. In the majority of instances in which the operation was performed for disproportion the indications appeared to be clear cut. On eight occasions the woman was a primigravida and evidence was given of severe pelvic deformity. However, on seven occasions, all classed as showing no avoidable factor, the patient was parous. One case had had nine, another five, and a third four previous and normal confinements. Information was lacking as to how the diagnosis of pelvic deformity was arrived at and by whom. In the remaining cases, the women having previously been delivered naturally, the decision to perform the operation was influenced by such factors as the age of the patient or the history of a previous difficult forceps delivery.

### *Uterine Inertia*

Under this heading are included all those cases in which induction failed to produce the onset of labour (14) or in which uterine inertia occurred in labour which started spontaneously (7) or followed induction (9). With the increasing safety of Caesarean Section it is not surprising that an increasing number of such cases are so treated, usually with complete success. Induction of labour is not an unusual procedure these days in many, if not most, obstetric units. Some departmental reports quote an incidence of induction of labour of about 10 per cent., while a few others appear confident that an even higher, sometimes much higher, rate is to be desired. Be this as it may, it is surely worthy of note that in no fewer than 23 of the 30 cases of death following Caesarean Section performed for the relief of uterine inertia, induction of labour had been attempted and could be said to have been unsuccessful. On 14 occasions induction had failed to produce the onset of labour, and in the remaining nine cases labour had started, but had been complicated by uterine inertia. These results can be tabulated as follows:

Method of Induction	Result	
	Unsuccessful	Uterine Inertia
"Medical" Induction . . . . .	2	2
Artificial Rupture of the Membranes . . . . .	8	3
Artificial Rupture of the Membranes and Pitocin . . . . .	4	4
	14	9

In one-third of these women, a relatively high proportion, the cause of death was sepsis, the remainder having died from embolus or haemorrhage. Haemorrhage, owing to failure of the uterine muscle to contract, was the cause of death in all but one of the patients who had received pitocin.

In general the indications for induction of labour would be considered orthodox and by most perfectly sound, but from the records it appears that in at least six instances the decision was not made by a consultant. It is possible, therefore, that the risk of Caesarean Section performed after rupture of the membranes has occurred may deserve emphasis. The value of prophylactic treatment with antibiotics is generally accepted.

### *Obstructed Labour*

On at least 13 occasions obstructed labour was treated by Caesarean Section. With a single exception at least one, usually more than one, most obvious avoidable factor was present. For this reason a somewhat more detailed consideration will be made. On ten occasions the operation was performed after attempts at forceps delivery had failed and it is in this group that occurs the one case in which the death was classed as unavoidable. In the remaining nine on six occasions too much responsibility appears to have been put on to registrars or junior medical officers. Some of these patients were undoubtedly lacking adequate ante-natal care or may have persuaded their doctor to agree to a most unsuitable home confinement. Others would have benefited from earlier admission to hospital or from assistance from the "flying squad". Whatever may have or may not have happened prior to admission to hospital a grave problem deserving of the most skilful attention was presented in every case. The upward delivery of the foetal head from the pelvic cavity can always be most difficult and the situation is never improved when attempts have been made previously to effect delivery from below. On only two occasions was a consultant noted to have been present at the operation. Three times the Caesarean Section was performed by the registrar and once by a medical officer designated as a clinical assistant. In one patient, pitocin induction having failed, labour eventually commenced and following ineffectual attempts with the forceps, delivery of a stillborn hydrocephalic foetus was accomplished. In two others Caesarean Sections were performed for deep transverse arrest of the foetal head, great difficulties being experienced in their execution. Another patient developed inertia in her labour. This was treated with pitocin administered intravenously and subsequently a contraction ring formed. Death resulted from uncontrolled haemorrhage occurring at the time of operation. Lastly, two cases of impacted shoulder presentation were delivered by Caesarean Section. One woman, having her eleventh baby, was cared for in the start of her confinement in her own home. In both there was much delay in diagnosis and in admission to hospital. In both it would have been wiser if the "flying squad" had been called. In fact, in all the cases cited above, except those already under the care of a hospital, the wiser procedure would have been to have called the "flying squad" or to have sought other and more skilled assistance.

## SUMMARY AND CONCLUSIONS

1. A survey has been made of 180 deaths following Caesarean Section. The calculated maternal mortality rate following Caesarean Section for the country as a whole is probably about 3.5 per 1,000 deliveries by this method.
2. The presence of avoidable factors where directly associated with the performance of the operation would appear to be limited in the main to its employment in the treatment of placenta praevia, obstructed labour and valvular disease of the heart. In patients suffering from pre-eclamptic toxæmia and eclampsia the avoidable factor does not appear to be concerned with the operation, but almost entirely with such matters as deficient ante-natal care or unwise arrangements for the confinement. Relatively few avoidable factors were apparent in the small number of deaths that followed the performance of a premeditated and pre-arranged operation.
3. Genuine and serious obstructed labour must be becoming progressively more rare as each year passes. Therefore, each case when it occurs demands the most skilful attention available. If the confinement takes place in the patient's own home, or in a small maternity home, the diagnosis indicates an immediate call for skilled assistance but not necessarily the transference of the patient to hospital.
4. Only after the most careful consideration should Caesarean Section be performed on patients suffering from cardiac disease.
5. It would seem necessary to repeat that, from the records of the present series of cases, evidence is still abundant that the operation was performed on many occasions before every effort had been made to restore the general condition of the patient. This was especially so in the case of some patients who suffered from ante-partum hæmorrhage.

## 8. DEATHS DUE TO COMPLICATIONS OF ANAESTHESIA

Deaths due to complications of anaesthesia show a progressive reduction from the figures quoted in the previous report—15 in 1952, 15 in 1953 and 19 in 1954. Of 31 cases reported here, death is considered to have been unavoidable by the anaesthetist in seven. In the others, although there were often complicating factors, the anaesthetic must be regarded as having been primarily responsible for the patient's death. Although the encouraging trend now recorded may be due to a more general awareness of the risks involved and the greater experience of anaesthetists called in to such cases, some lessons have not yet been learned.

### *Deaths due to complications of Anaesthesia*

	1955	1956	1957
Avoidable .. .. .	11	8	5
Unavoidable .. .. .	1	3	3
	<hr/> 12	<hr/> 11	<hr/> 8

### *Inhalation of Stomach Contents*

Inhalation of vomited or regurgitated stomach contents occurred in 18 of the 31 cases and in 17 it was the major cause of death.

Inhalation during forceps delivery .. .. .	10
"    "    caesarean section .. .. .	6
"    "    artificial rupture of membrane .. .. .	1
"    "    treatment of a contraction ring .. .. .	1

The anaesthetics employed are too diverse for any conclusions to be drawn from them. Five patients had received thiopentone for induction of anaesthesia and five, including three of the former, had been given a muscle relaxant. Ten had inhalation anaesthesia only. At least six of these died from pulmonary oedema following the inhalation of only small quantities of regurgitated acid stomach contents, often unnoticed at the time. It is striking that in ten cases, including three Caesarean Sections, tracheal intubation does not appear to have been planned. Two of the Caesarean Section patients died in 1955 and one in 1956. Although in seven cases vomiting or regurgitation occurred before intubation could be completed, it is likely that more widespread use of tracheal intubation has avoided many fatalities from this cause. In no case was there any record of an attempt having been made to empty the stomach before anaesthesia. It would seem also to be a wise precaution to intubate the trachea in all cases where the patient's stomach is thought to be full and where forceps delivery is to be undertaken in the lithotomy position.

### *Anaesthetic Agents*

Five patients died under chloroform or chloroform-ether anaesthesia, two of them from primary cardiac failure and three from inhalation of vomit. One case of primary cardiac failure occurred during attempted external version under endotracheal ether anaesthesia following induction with thiopentone and succinyl choline.

Spinal anaesthesia may have been a contributory factor in two cases, one a patient with a ruptured uterus and one said to be moribund in status asthmaticus. In one case it was the primary cause of death. This patient had had injected 11 ml. of 1/1,500 nupercaine and was placed in the prone position according to the Howard-Jones technique. The ensuing cardio-vascular collapse was almost certainly due to compression of the inferior vena cava against the bulky uterus.

One patient died of convulsions following the injection of 70 ml. of 1.5 per cent. lignocaine in the performance of a pudendal nerve block for forceps delivery. This is a valuable technique which avoids the dangers of general anaesthesia. It can be carried out satisfactorily and more safely using not more than 75 ml. of 0.5 per cent. lignocaine containing 1/300,000 adrenaline.

### *The Administrators of the Anaesthetic*

In five cases the anaesthetic was administered by a consultant anaesthetist: in three of these the death is considered to have been unavoidable. No conclusion can be drawn from an analysis of the status and experience of the other anaesthetists as the number of patients anaesthetised by each group is not known.

In five, and possibly six, cases the anaesthetic was administered by the single-handed obstetrician. There can be very few obstetric emergencies whose urgency justifies this practice. Four of these patients died of inhalation of inspired vomit and two of primary cardiac failure. In one of these an anaesthetist was readily available and, in fact, arrived within five minutes of being summoned.

The case records suggests that many of these tragedies could have been avoided by a more experienced anaesthetist, and there is still room for improvement in this direction. A consultant anaesthetist should be responsible for anaesthesia in the obstetric department, for the instruction of his juniors, and should be available for consultation by them in any case of difficulty.

## 9. SUDDEN DEATH IN LABOUR

In the present series sudden death in labour (excluding pulmonary embolism) occurred on 44 occasions. Some of these cases have been included elsewhere in the primary classification, but they are all cases where the death certificate stated that death was due to obstetric shock, air or amniotic embolism or unknown causes. The causes are divided into the following headings, each of which will be considered separately:—

Obstetric shock	..	..	17
Amniotic embolus	..	..	11
Air embolus	..	..	9
Various	..	..	7
			—
			44
			—

### *Obstetric Shock*

In 17 instances obstetric shock, for various reasons, was considered to be the cause of death, and these cases present throughout a great similarity not only in the clinical picture but also, as will be pointed out, in other aspects. An avoidable factor was considered not to be present in nine, doubtfully present in two, and definitely present in no fewer than six of these patients. The clinical picture is so constant that it is considered justifiable to present in the briefest possible form the events that preceded the sudden death of these women.

### *Cases with avoidable factors present*

By the adoption of measures of proven and acknowledged value a different result might have been expected in these six cases.

Thus, two women who in their first pregnancies were confined at home experienced a very long first stage of labour. In neither case was advice sought during this difficult and potentially dangerous time. After a lengthy period in the second stage the doctor in each case succeeded in the delivery of the baby (in one case stillborn) following a difficult and prolonged forceps operation. The absolute necessity for skilled assistance at this point was again not realised. Following delivery both women experienced, as might have been anticipated, a severe and suddenly fatal post-partum haemorrhage. Another patient, who had had severe pre-eclamptic toxæmia in a previous pregnancy, was booked for confinement in her own home. This was unwise, as also was her subsequent care at home, when this illness again made its appearance. Surgical induction of labour was then performed. If surgical induction is justified so also is admission to hospital. Sudden death occurred during a violent post-partum haemorrhage. At no time in this case was expert advice sought and no suggestion was made for her transfer to hospital.

In another case, again an unwise booking of a grand multipara for confinement was made in a small maternity home. Her parity and her age alone indicated the necessity for arranging a hospital confinement. As often happens with such women, labour was lengthy, and after some hours in the second stage, prolonged efforts by her doctor failed to deliver the baby with the forceps. Skilled assistance should have been obtained immediately failure became apparent. The baby was stillborn and manual removal of the placenta was accompanied by sudden collapse and death.

Two other women died suddenly, one in hospital and one in her own home, following prolonged and unsuccessful attempts at rotation of the foetal head. In neither case was skilled assistance sought early enough. In one case two doctors made attempts to deliver the baby with forceps. Finally the patient was transferred to hospital where the baby was delivered "without difficulty."

The list of avoidable factors found in the above cases may be summarised as follows:

- (a) Failure to appreciate the wisdom of arranging for hospital confinement in the older age groups.
- (b) Failure to appreciate the wisdom of arranging for hospital confinement in the high parity groups.
- (c) Failure to arrange for hospital confinement in women who had had pre-eclamptic toxæmia in preceding pregnancies.
- (d) Failure to seek expert advice and assistance for women whose labours took place both in hospital and in their homes for (i) an unduly long first stage of labour, and (ii) delay in the second stage of labour, especially when attempts to complete delivery with the forceps were unsuccessful.
- (e) Lastly might be listed the failure to anticipate in an exhausted uterus the likelihood of violent and fatal post-partum hæmorrhage.

So consistent are the clinical pictures of the cases of sudden death in this series that it is considered valuable to review as briefly as possible the clinical histories of the remaining 11 cases in which no avoidable factor was thought to exist.

#### *Cases classed as unavoidable*

- (1) A young primigravida who was suffering from severe pre-eclamptic toxæmia was watched in hospital for at least four weeks. Finally labour was induced surgically and the ensuing and normal labour was followed by collapse and death. At a post-mortem examination undertaken by a coroner's pathologist, no cause for death was found. There was no microscopical examination.
- (2) The circumstances of this case were identical with the one above except that the patient was watched at home. The first stage of labour was long and a difficult forceps delivery was followed by collapse and death. Post-mortem no cause for death was found.
- (3) A primigravida confined in her own home and suffering from pre-eclamptic toxæmia was treated, in the opinion of the consultant who eventually saw her, "too energetically with hypotensive drugs." The onset of labour was spontaneous. The placenta was retained. The flying squad was summoned and manual removal of the placenta was followed by collapse. No post-mortem examination was made.

- (4) A woman with her fourth baby, confined in hospital, went into labour and an arm prolapsed. This was treated by (difficult) internal version. Severe post-partum haemorrhage was followed by collapse. Post-mortem examination showed death from exsanguination.
- (5) A primigravida suffering from pre-eclamptic toxæmia had a surgical induction of labour. The cord prolapsed and internal podalic version was performed. A difficult breech extraction was followed by manual removal of the placenta. The patient collapsed and died. A full post-mortem examination showed "Death from shock and haemorrhage."
- (6) A woman aged 40 having her fifth baby, the previous confinements being normal, had "a difficult forceps" extraction, whereupon she collapsed and died. Death (clinically) was due to shock. A post-mortem examination was "conducted by the Coroner's pathologist, so no report was available."
- (7) A woman having her fourth baby in hospital, her previous confinements being normal, had a forceps delivery accompanied by severe lacerations and followed by manual removal of placenta. She collapsed and died. The post-mortem findings: "All organs normal." No microscopical examination was made.
- (8) A primigravida confined in hospital. A long first stage terminated in a forceps delivery, with manual removal of placenta followed by collapse and death. The post-mortem report: "Many lung changes observed, but death due to obstetric shock." No microscopical examination was made.
- (9) A woman having her fifth baby in hospital. A Caesarean Section was performed for foetal distress. There was a haemorrhage and the patient died. There was a post-mortem examination but no microscopy. The report stated that death was "due to natural causes, namely, shock following Caesarean Section."
- (10) and (11) These last two cases were identical in that the patient suddenly collapsed and died, one at the end of the first stage of labour and the other one hour after the completion of labour. The post-mortem examination (including a microscopical examination of tissue in one case) failed to discover the cause of death.

Throughout this series of 17 cases in almost every instance the labour was complicated by major interference often associated with tissue damage and loss of blood. Preceding the onset of labour the patient's general state of health was impaired by severe pre-eclamptic toxæmia in at least five cases. The presence of one or more avoidable factors gives information of procedures which by their avoidance may lead to greater safety in childbirth.

Much helpful knowledge has been lost in the post-mortem technique. Out of the 17 cases no post-mortem examination was performed in three. In no fewer than ten instances an almost perfunctory search for the cause of death appears to have been made. It is impossible to lay sufficient emphasis on the vital importance in all these cases of the fullest and most careful investigation, for probably only by this means is our knowledge of the problem likely to be increased.

An analysis of such factors as the place of confinement, age and parity of the patient, is of no statistical value owing to the small number of cases. It would appear, however, that an undue proportion occurred in the older age groups and higher parities.



### *Amniotic Embolus*

No death has been included under this heading unless the diagnosis had been made by the microscopic examination of the lung tissue. Therefore, in every instance a post-mortem examination had been made and in every instance this examination appeared to have been fully and carefully performed. It is most probable that if such an examination had been conducted in all those women whose death in the preceding section had been certified as having been due to "shock," some cases would have appeared in this one. On more than one occasion those present at the time of the women's death expressed the opinion that clinically the cause might be expected to be that of an amniotic embolism. That such deaths do present a consistent picture seems certain. The observation is made repeatedly to the effect that the sudden deterioration of the patient's condition was rapidly followed by pronounced cyanosis. This was noted in four cases who had been certified to have died of obstetric shock, but as has been stated already, only naked eye observations were made of the various organs.

The onset of amniotic embolism would appear to take place at any time in labour, though in four out of the eleven cases it occurred at the end of the first stage. That it is associated with unusually strong or colicky contractions of the uterus would certainly appear to be probable. Thus one woman died suddenly shortly after the commencement of a "successful" pitocin induction of labour, and in two cases which were well until the end of the first stage the uterine contractions had been believed and noted to have been unusually strong. One death occurred after labour had been established for about five hours, one at the time of the birth of the baby, and three after completion of the third stage. In one case death occurred after the placenta was removed manually, and this was the only instance of abnormal labour. In not one case in this group was an avoidable factor believed to have been present.

An analysis of the age and parity of the mothers shows an undue proportion of women in the older age groups and those who previously have had children.

### *Air Embolus*

Nine women died suddenly and at post-mortem examination the cause of death was found to be air embolus. The occurrence of this condition would appear commonly definitely to be associated with manual separation of the placenta. In no fewer than four cases manual removal had been performed, and in two others sudden collapse and death occurred at the time of Caesarean Section. In the remaining three cases, two had a normal labour, and in the last death occurred at the time of embryotomy following failed forceps. In only one case was an avoidable factor judged to have been present in that undue and unjustified responsibility was left to a very junior medical officer. All but two of the patients were delivered in hospital and six out of the nine were primigravidae.

### *Various Causes*

A heterogeneous group of seven cases has been included under this heading. In two instances it is possible, if not probable, that death resulted from amniotic embolus. One, a primigravida, was to be confined at home. After an unusually lengthy period of observation for severe pre-eclamptic toxæmia, labour was

induced by artificial rupture of the membranes. The condition became more pronounced and the patient was transferred to hospital where she died suddenly during delivery. No post-mortem examination was made. The second patient, who was expecting her sixth baby, also confined at home, collapsed and died at the end of the first stage of labour. Post-mortem examination showed "Thrombotic pulmonary infarction." A third woman died suddenly during the delivery of a second twin. Death was certified as having occurred from acute cardiac failure, the result of parturition. Another patient died at the time of a "fit" which occurred four hours after delivery. Death was thought to be due to "shock and eclampsia." "Massive necrosis of the anterior part of the pituitary gland" and "haemorrhage into the suprarenal glands" were findings in two other cases. In the remaining case, that of a primigravida found dead after what was described as a short labour, the pathologist certified the cause of death as being "amniotic embolus of the liver." This group of cases brings out one of the special difficulties of this enquiry where sudden death has occurred, an autopsy may be ordered by a coroner. If such an autopsy is conducted by a pathologist expert in forensic work, as is usual, but not specially experienced in obstetric work, the results are often less helpful and sometimes quite useless for the purposes of this enquiry.

## SUMMARY AND CONCLUSIONS

1. Consideration of the few avoidable factors present in this series of cases brings to light no fault that has not been fully considered elsewhere. If such avoidable factors were present, they could have been avoided by the application of common knowledge to not unusual circumstances, or by promptly sending for assistance.
2. Attention has, however, been directed to the fact that too often a post-mortem examination tends to lose value by not being specifically directed to obstetrical features of the case.

## 10. RUPTURE OF THE UTERUS

Rupture of the uterus occurred on 33 occasions and was thought in every case to account for the death of the women. It is possible that other cases of rupture of uterus occurred but remained undiagnosed as no post-mortem examination was carried out. These might therefore have been allocated to other causes such as post-partum haemorrhage.

### *Age and Parity*

It would appear that uterine rupture is more likely to occur in the older age groups and in multiparous women. This is shown below, but the numbers are small.

*Table XVI. Age and Parity of women who died from ruptured uterus compared with all births*

Age	Deaths from Ruptured Uterus		Total registered† births Percentage
	Number	Percentage	
Under 20 .. ..	—	—	5.4
21-30 .. ..	5	15.1	60.7
31-40 .. ..	23	69.7	30.6
40+ .. ..	5	15.1	3.2
Total .. ..	33	99.9	99.9
Parity*			All registered† Legitimate live Births
1 .. ..	1	3.0	40.0
2 .. ..	4	12.1	29.8
3 .. ..	6	18.2	15.1
4 .. ..	5	15.1	7.3
5+ .. ..	17	51.5	7.8
Total .. ..	33	99.9	100.0

No avoidable factor was considered to be present in 19; an avoidable factor was present in 12 and doubtfully so in two. Scrutiny of the records of these cases produces certain facts of interest.

### *Time of Rupture*

In all but one of these 33 cases it was possible from the information supplied in the records to judge the time of the trauma. Uterine rupture occurred only once during pregnancy. In 13 cases the accident occurred in the first stage of labour and late in the first stage in nine of this group. It took place during the

† \* See footnote page 4.

second stage of labour on 15 occasions, but as will be seen in several of these it was then caused by intrauterine manipulation. Uterine rupture appeared to take place three times during the third stage of labour and to accompany efforts directed to removal of the placenta; at any rate no rupture was suspected prior to, nor was it noticed at the time of manual removal in two cases, but was discovered at subsequent examination. In the remaining case the notes were inadequate and no estimate of the time of rupture was possible.

#### *Previous Caesarean Section*

Five women had been delivered previously by Caesarean Section. Rupture had occurred at the site of the scar in the lower segment of the uterine wall in three cases and following a classical section in one case. In the remaining case the scar of the previous operation had remained intact and the rupture, which had occurred posteriorly, was thought to have started at the site of perforation of the uterine wall by a Drew-Smythe catheter. No avoidable factor was thought to be present in any of these cases.

#### *Spontaneous Rupture*

Spontaneous rupture during labour occurred on eight occasions, four times at the end of the first stage and four times during the second stage. All the women were multiparae as follows: two were having their eleventh babies, and one each their tenth, ninth, eighth, sixth, fifth and fourth babies. Both the women having their eleventh and tenth babies had been allowed to make arrangements for their confinement to take place at home; surely a most unwise procedure.

#### *Rapid Labour*

That labour was unusually rapid and that the uterine contractions were abnormally powerful and prolonged was noted in four cases. Labour had been induced in three cases, including two by pitocin. In one of these, in which an extremely rapid labour followed the use of pitocin, all seemed to be well until the third stage of labour. Difficulty was experienced with the delivery of the placenta, and traction on the umbilical cord was employed. Some considerable force must have been used, as according to the record the attachment of the placenta to the uterine wall was abnormal, and the actual traction was believed to have been responsible for the tear. In the fourth case, rupture appeared to follow immediately after the intravenous injection of ergometrine, and the case notes include the words "Ergometrine was used with the birth of the shoulders as labour was so precipitate."

#### *Manual Removal of Placenta*

In two cases rupture was thought to have been produced during efforts made manually to remove the placenta.

#### *Previous Amputation of Cervix*

In two women who had previously been treated for cervicitis by cauterization and amputation of the cervix, rupture occurred after many hours in the first

stage of labour. In both an extensive tear was found which, probably starting in the cervix, extended up the left side of the uterus.

### *Intra-uterine manipulations*

That uterine rupture was caused by, or at least associated with, extensive and difficult intrauterine procedures performed to assist delivery will give rise to no surprise. Obstructed labour was produced by the large head of a hydrocephalic foetus on three occasions. Two of these women, both multiparae, including a woman expecting her eighth baby, had arrangements made for their confinements to take place in their own homes, and in both the diagnosis of obstructed labour was made too late and the cause was missed completely. In three more the rupture appeared to occur during prolonged and unsuccessful attempts to deliver the baby with the obstetric forceps. Two of these three cases, one being a woman expecting her ninth baby, were confined at home, and in the remaining case, a woman expecting her sixth baby, who previously had had two difficult forceps deliveries, arrangements were made for her to be delivered in a small maternity home.

In three more cases unwise booking arrangements were almost certainly directly responsible for conditions leading to the rupture of the uterus and thus to the deaths of the women. In the first, home confinement was arranged for a woman in her third pregnancy, who had previously had a long and difficult labour with a very definite contraction of the pelvis, which had been diagnosed in hospital. Labour was unduly prolonged and the patient was transferred to hospital far too late. Apart from rupture of the uterus the foetal skull was grossly moulded. The second case, a woman expecting her sixth baby, who had previously had two babies delivered with forceps, was a known and severe diabetic. In spite of this a home confinement was arranged, and in addition ante-natal care from both the doctor and the midwife was negligible. Pre-eclampsia developed and the presence of an undiagnosed brow presentation led to uterine rupture. The third case, a woman expecting her fourth baby, was also booked for confinement in her own home, in spite of the fact that she was known to have a contracted pelvis, with a history of one baby being delivered with forceps, and the other two by difficult breech extractions. Not only was there delay in her transference to hospital as an obstructed labour with a face presentation, but 36 hours elapsed after her admission before she was seen by the consultant "on his routine round."

### *Internal Podalic Version*

Lastly, rupture occurred during attempts at internal podalic version in two cases. In one of these patients this difficult procedure was left in the hands of a most junior medical officer, who possessed neither the experience to judge as to its advisability nor skill in its performance.

## SUMMARY AND CONCLUSIONS

1. The majority of cases of rupture of the uterus are found to be associated with obstructed labour or extensive intrauterine manipulations.
2. In four instances rupture occurred in the scar of a previous Caesarean Section. In three instances rupture was associated with the use of oxytocic drugs.
3. The high incidence associated with older women and with multiparity emphasises once more the vital importance of the making of appropriate arrangements for the confinement.
4. The fatal result in some of these cases would probably have been avoided by correct booking and by seeking a consultant's opinion, both in domiciliary and hospital cases, at a much earlier time in labour.

## 11. ASIAN INFLUENZA 1957

During the months of September, October and November, 1957, an epidemic of Asian Influenza spread across this country.

In 1958 the Public Health Laboratory Service<sup>1</sup> reviewing the deaths from this disease found that out of 103 women aged 15 to 44 years, 12 were pregnant and that this was about double the expected number in the group. Oswald<sup>2</sup> reporting a series of cases of pneumonia complicating Asian Influenza, stated that "in its later stages, pregnancy certainly constitutes a hazard when influenzal pneumonia is superimposed. Of seven pregnant women in this series, two died, one having mitral stenosis in addition. The others were all very ill, and four delivered their babies at the height of the infection."

Every year there are usually one or two deaths from influenza associated with pregnancy and childbirth included in the Confidential Enquiry, but during 1957 this figure rose sharply as follows:—1955, two deaths; 1956, one death; and 1957, 21 deaths. Twenty of the deaths during 1957 occurred during the epidemic period. In addition to the cases reported, eight deaths were recorded by the General Register Office as due to influenza associated with pregnancy and childbirth, but were missing from the Confidential Enquiry. One death occurred during pregnancy and was associated with an abortion, in two cases death occurred during labour or the puerperium and in the remainder the time was not given.

From the returns of the Registrar General the total number of deaths from influenza which occurred among women in the age group 15 to 45 years is known, and the number of women who were pregnant or were in labour or in the puerperium can be calculated. The expected number of deaths which might occur among women during pregnancy and childbirth can be estimated from these data.

*Table XVII. Maternal Deaths associated with Influenza*

	In the Enquiry	Missing Cases	Total Number	Expected Number
Month, 1957				
September ..	9	2	11	6
October ..	11	6	17	11
November ..	0	0	0	1
	20	8	28	18
	—	—	—	—

Table XVII shows the number of cases which occurred during the three months of the epidemic both in the enquiry and among the "missing" cases compared with the expected number of deaths. From this table it can be seen that there were half again as many cases among pregnant women as would be expected among all women of a similar age group.

Table XVIII. Number of Maternal Deaths associated with Influenza

	In the Enquiry	Missing Cases	Total No.	Expected No.
Two to eight months (incl.)	10	1	11	12
Labour and puerperium..	10	2	12	5
Unknown .. .. .	0	5	5	0
	—	—	—	—
	20	8	28	17
	—	—	—	—

Table XVIII shows the actual and expected number of cases according to the stage of pregnancy or labour and puerperium. While it is probable that most of the "unknown" cases were among the first category it is not certain; so that if these are ignored, it can be said that there is probably no increased risk of death from influenza during pregnancy. During labour or the puerperium, however, the risk is at least twice as great as among non-pregnant women in the same age group. It should be noted here that all ten women who died during labour or the puerperium, and were included in the enquiry, had some symptoms of influenza before they went into labour and died within five days after childbirth.

Among the 20 cases for which reports were received, six had some degree of mitral stenosis. In two cases it was only found after death, three had no symptoms and were recognised by a systolic apical murmur only, and the remaining case was said to be well compensated. Half of these women died during pregnancy and the other half after delivery. Among the eight "missing" cases four were recorded as having mitral stenosis.

It therefore appears that the risk of death is increased where Asian influenza complicates late pregnancy or labour, and the risk is even greater if the patient also has mitral stenosis, however slight.

## SUMMARY

1. Twenty cases of death from Asian influenza associated with childbirth and pregnancy were reported during the epidemic of September-November, 1957. Eight further cases were recorded on the death certificates, but were missing from the enquiry.
2. There is an increased death rate from Asian influenza if the patient is near term or in labour.
3. Special care seems to be needed for those patients with even mild mitral stenosis who contract Asian influenza.

## References

<sup>1</sup> Public Health Laboratory Service (1958) *British Med. J.* 1. 915.

<sup>2</sup> Oswald, N. C., Shooter, R. A., and Curwen, M.P. (1958) *British Med. J.* 2. 1311.



## 12. THE AVOIDABLE FACTORS IN THE WHOLE SERIES

One of the objects of this confidential enquiry is the investigation of as many as possible of the maternal deaths which occur in England and Wales, thereby to find what mistakes were made and how often. Publication of the analysis should make possible the avoidance of some of these mistakes in the future. Anaesthetic deaths have been analysed in Chapter 8 and need not detain us further. Ectopic pregnancies are not relevant to this enquiry.

Reports of 861 deaths directly ascribed to pregnancy and childbirth were received for this enquiry for the years 1955 to 1957. For this period the number so assigned by the Registrar General was 1,112. Of the 861 deaths, 353 or 41.0 per cent. had avoidable factors. Deaths reported to the enquiry as assigned to the category "associated with pregnancy and childbirth" numbered 339, of which 57 or 16.8 per cent. had avoidable factors. The total assigned to this category by the Registrar General was 368.

Most of the avoidable factors were the responsibility of individuals and only a small proportion was due to administrative failures. The aim is through close study of the causes of the deaths, to help to prevent such mistakes occurring in the future and thus improve further the maternity services of the country. In order, therefore, to avoid unjust imputation of blame to persons or particular professional groups, it has been decided to ascribe the avoidable factors to the services in which they were made, that is, domiciliary or hospital, except where the patient herself contributed to her death. The hospital and domiciliary services are not, however, two distinct and separate bodies. Much overlapping can and does occur between them and reading these reports it becomes very obvious how interlocked they are and how dependent they are upon one another. Hospital patients often receive interim ante-natal care from members of the domiciliary team, while the domiciliary services call upon the hospitals in cases of emergency or when abnormalities develop. Patients confined in general practitioner maternity hospitals and private nursing homes are considered under the domiciliary maternity service. Some mistakes made by the domiciliary services such as wrong booking for confinement, can only be ascribed to the hospitals if booking is refused. Hospitals patients tend to include more of the potentially abnormal, and therefore lapses in care are more likely to have serious consequences than among the potentially normal cases. It is not, therefore, possible to compare the two services and such comparison would be highly misleading.

During a period when over two million births occurred, 253 deaths due to pregnancy and childbirth together with 57 associated therewith were thought to have avoidable factors. In 55 cases the patient herself was considered to be wholly responsible and in 26 partially responsible for the avoidable factor. Avoidance of avoidable factors in the hospital services might have saved 75 lives and assisted in saving eight more where the patient herself also contributed. Similarly, avoidance of avoidable factors in the domiciliary services might have saved 121 lives and helped in saving 18 others where the patient herself was also

responsible. Thirty-three other lives might have been saved by better care from both the domiciliary and hospital services. It therefore appears that during these three years, two deaths occurred each week which might have been prevented. At least one in six of these errors was made by the patient herself.

The avoidable factors occurred in 197 deaths during the ante-natal period; in 35 deaths during both the ante-natal period and labour; in 65 during labour; in nine during the puerperium and in four during both the ante-natal period and puerperium.

#### *Avoidable factors which occurred during the ante-natal period*

In the following discussion abortions have not been included as the avoidable factors have already been described in Chapter 5.

During the ante-natal period some patients tended to conceal their pregnancy until they went into labour or until toxæmia or other diseases were well established. Some failed or refused to take the advice given by their professional attendants or did not attend for examination when asked to do so. Others refused to book for hospital confinement even when most strongly urged to do so, while a few, even when very ill, refused admission for in-patient hospital care. Where the responsibility was shared with other services it was felt that due to lack of understanding of the patient's difficulties and from failure to explain fully the need for hospital care, women who could have been persuaded to accept the advice offered did not do so. Patients who were too ill and worried to understand their need for more care might have been persuaded to accept advice if the co-operation of the husband or other relative had been sought. Again, patients who failed to attend appointments at the clinic or surgery were not followed up in their own home.

The basic avoidable factors during the ante-natal period were very similar in the hospital and domiciliary services. The large majority of cases were considered to have had inadequate ante-natal care. In a small number there was complete lack of care, but on the whole the number of examinations was adequate, some women even having had an unnecessarily large number of examinations. The inadequacy of the ante-natal care was due to failure to appreciate the significance of the findings. Undue concentration on the mechanical aspects of obstetrics seemed to divert attention from the patient's general health. Both in the hospital and domiciliary services patients were not sent for consultant advice or to hospital early enough. Another obvious shortcoming in both services was the omission to take blood examinations for haemoglobin estimations and to report the examinations after treatment for anaemia. The lack of follow-up of patients who did not keep their appointments at clinics or surgeries was another important point. In both services there was evidence of lack of co-operation between the various departments within the individual service and between each other. Often the hospital services failed to make use of the domiciliary services and vice versa. In the domiciliary services wrong booking of potentially abnormal cases for confinement, either at home or in a general practitioner maternity unit was a very important avoidable factor. Tables III and IV in the appendix show that primigravidae over the age of 30, all other women over the age of 35 years, and women having their fifth or more child are at a much higher risk than the remainder. Previous obstetric and medical history is of great importance. The booking for home confinement or

confinement in a general practitioner unit of women with histories of diseases and abnormalities, such as toxæmia, previous stillbirths, difficult forceps deliveries and prolonged labour, retained placenta, as well as medical conditions, such as cardiac disease and essential hypertension, is to be deplored. In the hospital services instances of deficient in-patient care and failure to book on account of lack of beds did occur but were very few in number. One case where several hospitals refused to book a woman because she was a "difficult" patient demands special mention.

#### *Avoidable factors during labour*

Poor management during labour was the primary avoidable factor among this group. In the hospital service, junior medical staff sometimes attempted difficult operative deliveries unsupervised by their more senior colleagues. Such duties had occasionally been delegated over the telephone without the patient having been seen by anyone of sufficient experience. Failure to summon a consultant early enough appeared to be due, in some cases, to faulty organisation of the department or unsatisfactory delegation of duties. In the domiciliary service complicated malpresentation and difficult forceps deliveries were attempted under most unsuitable conditions, sometimes the doctor even administering the anaesthetic as well as doing the forceps delivery. Failure to recognise the seriousness of the patient's condition resulted in delay in blood transfusion in the hospital service or in summoning the flying squad in the domiciliary service. Occasionally unnecessary time was lost when the midwife attempted to find the doctor rather than calling for the flying squad direct. In the patient's own home, induction of labour, either surgically or by the use of pitocin contributed to the death of a few women. Administrative difficulties played only a small part during labour except in one area where a flying squad was not available. Neglect to follow medical advice and refusal to go to hospital were the chief avoidable factors attributable to the patients. A few patients did not summon help when they went into labour.

#### *Avoidable factors which occurred during the puerperium*

In the domiciliary service the chief fault during the puerperium was a lack of appreciation of the gravity of the patient's general condition. In the hospital service surgical procedures which could well have been postponed to a later date were undertaken during the puerperium. Early discharge from hospital does not appear to have been an important factor, except in one case where a patient was discharged on the seventh day after labour having had a pyrexia for six days. Two patients were considered to have contributed to their own deaths by discharging themselves against medical advice.

#### *Prevention of maternal deaths*

Better and more intelligent ante-natal care, with a proper selection of patients for hospital confinement, could prevent a substantial number of maternal deaths. For this purpose a well worked out programme of ante-natal examinations to cover the whole of normal pregnancy which is sufficiently flexible to allow more frequent supervision is essential. The results of such examinations

must be assessed both individually and in relation to previous examinations. Where the care is undertaken by several individuals then each must be aware of the findings of the other. It is the lack of co-operation between such persons with no one clearly responsible which often results in a patient receiving poor ante-natal care despite a quite adequate number of examinations.

The patient herself plays a very important part in her own care and the success or failure of the maternity service will ultimately depend upon her. More investigation is needed into the reasons why women conceal pregnancy from doctors and midwives, and why they will refuse treatment to such an extent as to become the primary cause of their death. Better health education, more understanding of their problems, perhaps more considerate treatment in some hospitals, and more use of the home help service can be some of the ways in which the maternity services could help to save the lives of these unfortunate women.

Two reports on Confidential Enquiries into Maternal Deaths have now been published. Has the work and trouble involved in their production been justified? Can we expect a further and substantial reduction in maternal mortality, and foetal perinatal deaths for the two must run concurrently? Is it not probable that an irreducible minimum or hard core must be recognised and is not this figure nearly reached? These and similar questions must have been asked many times and with a maternal mortality rate in 1958 of less than 0.4 per 1,000 not without justification. There will be some, however, who must clearly remember exactly similar doubts being raised only a quarter of a century ago, when the maternal mortality figure was no less than ten times what it is today.

Much, too, can be expected by the steady improvement in co-ordination of the three sectors of the maternity services. If the pace has been slow, the final result may be the more effective for that reason. If, therefore, the profession is prepared to study lessons that can be learnt from these reports and to implement suggestions made in them it is most probable, if not certain, that a maternal mortality certainly of two, and probably of one, per 10,000 births is obtainable. There are ample grounds for belief that childbirth will continue to become ever more safe and that no small part will be played by an unremitting vigilance on a national scale.

Table 1. Deaths Due to Pregnancy and Childbirth

Inter-national List No.	Cause of Death	1955				1956				1957			
		Enquiry Section		R.O.	Avoidable	Enquiry Section		R.O.	Avoidable	Enquiry Section		R.O.	Avoidable
		Total	Percentage			Total	Percentage			Total	Percentage		
640	Pellitis and pyelonephritis	2	3	2	1	3	3	3	1	6	3	7	3
641	Other infections of genito-urinary tract during pregnancy	2	55	29	34	61	34	82	27	167	90	236	53.9
642	Toxaemia of pregnancy	1	5	3	2	3	2	10	5	14	6	19	42.9
643	Placenta previa	2	2	2	2	12	3	3	3	23	14	33	60.9
644	Other haemorrhage of pregnancy	3	4	3	2	2	2	3	3	9	8	9	88.9
645	Anaemia of pregnancy	23	6	15	1	23	17	23	1	55	12	55	8.3
646	Pregnancy with malposition of foetus in uterus	20	17	13	24	17	13	24	15	62	42	75	8.3
647	Pregnancy with malposition of foetus in pelvis	27	17	13	24	23	13	34	15	55	40	75	72.7
648	Other complications arising from pregnancy	36	28	21	40	28	19	33	18	109	82	109	70.7
649	Ectopic pregnancy	3	2	1	8	1	1	4	1	15	4	15	25.0
650	Abortion without mention of sepsis or toxemia	1	1	1	1	1	1	7	7	9	9	9	10.0
651	Abortion with sepsis	21	13	7	23	11	3	20	4	64	31	64	48.4
652	Abortion with toxemia without mention of sepsis	16	11	6	10	5	3	5	5	31	24	31	38.3
653	Delivery without complication	25	26	13	14	10	6	17	4	56	49	56	46.9
654	Delivery complicated by retained placenta	3	—	—	1	1	1	1	1	5	3	5	33.3
655	Delivery complicated by abnormality of bony pelvis	10	7	5	15	13	5	10	6	30	16	35	53.3
656	Delivery complicated by disproportion or malposition of the foetus	18	8	4	18	5	—	16	3	16	5	32	31.3
657	Delivery complicated by prolonged labour of other origin	—	—	—	—	—	—	—	—	—	—	—	—
658	Delivery with laceration of perineum, without mention of other laceration	12	14	5	10	12	4	14	4	36	25	36	40.0
659	Delivery with other trauma	11	18	2	5	12	4	9	3	25	42	25	50.0
660	Delivery with other complications of childbirth	13	18	3	8	14	3	16	6	37	46	37	46.1
661	Postnatal urinary infection without other sepsis	32	—	—	27	14	—	24	—	83	—	83	26.1
662	Sepsis of childbirth and the puerperium	23	57	5	5	56	6	8	3	36	147	36	9.5
663	Puerperal phlebitis and thrombosis	8	3	—	3	3	—	5	—	21	4	21	0.0
664	Puerperal pulmonary embolism during the puerperium	1	—	—	—	—	—	—	—	—	—	—	—
665	Puerperal pulmonary embolism	6	3	—	3	3	—	4	—	15	6	15	0.0
666	Puerperal eclampsia	3	—	—	—	—	—	—	—	—	—	—	—
667	Other forms of puerperal toxemia	6	3	—	3	3	—	4	—	1	1	1	0.0
668	Cerebral haemorrhage in the puerperium	3	2	—	—	2	—	2	—	6	5	6	16.7
669	Other and unspecified complications of the puerperium	1	—	—	—	—	—	—	—	5	1	5	20.0
670	Mastitis and other disorders of lactation	—	—	—	—	—	—	—	—	—	—	—	—
Maternal deaths omitting those due to ectopic pregnancy and abortion		319	257	87	228	83	193	251	83	678	253	651	37.5
Maternal deaths due to ectopic pregnancy and abortion		36	62	36	69	32	52	82	32	183	100	261	54.6
Total Maternal Deaths		405	319	123	374	297	115	333	115	861	353	912	41.0

Table 2. Deaths Not Classified to Pregnancy and Childbirth but Associated Therewith

Cause of Death	1955			1956			1957			1958-1957		
	Enquiry Series		R.O.	Enquiry Series		R.O.	Enquiry Series		R.O.	Enquiry Series		Total
	Total	Avail-able		Total	Avail-able		Total	Avail-able		Total	Avail-able	
I. Infective and Parasitic Diseases	12	1	12	5	1	9	7	—	28	22	—	2
Tuberculosis	6	1	6	3	1	3	3	—	15	8	—	2
Cardio-vascular syphilis	—	—	—	—	—	—	1	—	—	—	—	—
Septicæmia and pyæmia	—	—	—	—	—	—	—	—	—	—	—	—
Meningococcal infections	1	—	1	1	—	1	—	—	2	1	—	—
Tetanus	2	—	2	1	—	1	—	—	—	—	—	—
Acute poliomyelitis	2	—	2	1	—	1	—	—	4	1	—	—
Acute infectious encephalitis	3	—	3	2	—	2	—	—	6	4	—	—
Infectious hepatitis	6	—	6	13	1	15	11	1	32	32	—	2
II. Neoplasms	7	—	7	3	—	3	3	—	17	6	—	—
III. Allergic Endocrine System and Metabolic Diseases	2	—	2	1	—	1	—	—	—	—	—	—
IV. Diseases of the Blood and Blood-forming Organs	10	—	10	7	—	7	3	—	32	29	—	—
V. Diseases of the Nervous System	33	9	33	54	22	45	45	43	128	132	43	32-6
VII. Diseases of the Circulatory System	20	5	20	37	19	34	25	22	79	79	33	1
Rheumatic fever	4	—	4	3	—	3	13	9	24	18	6	41-8
Diseases of mitral valve	1	—	1	1	—	1	13	8	33-3	3	—	—
Other diseases of heart	5	—	5	3	—	3	5	5	11	3	—	27-3
Hypertensive disease	13	—	13	14	3	14	32	28	61	57	3	8-9
Other circulatory disease	2	—	2	2	—	2	18	21	20	24	—	—
VIII. Diseases of the Respiratory System	7	—	7	16	1	8	10	5	24	18	2	11-1
Influenza	4	—	4	4	—	4	2	1	10	5	—	—
Pneumonia	2	—	2	3	—	3	3	—	7	10	1	10-0
Brucellosis	2	—	2	1	—	1	5	—	23	27	—	—
Other diseases of respiratory system	3	—	3	9	—	10	—	—	2	2	—	—
IX. Diseases of the Digestive System	1	—	1	2	—	2	—	—	2	2	—	—
Diseases of oesophagus	2	—	2	1	—	1	—	—	2	1	—	—
Ulcer of stomach	2	—	2	1	—	1	—	—	2	1	—	—
Acute appendicitis	5	—	5	3	—	3	—	—	3	3	—	—
Hernia of abdominal cavity	—	—	—	—	—	—	—	—	—	—	—	—
Other diseases of intestines and peritoneum	—	—	—	—	—	—	—	—	—	—	—	—
Diseases of biliary system	—	—	—	—	—	—	—	—	—	—	—	—
Diseases of liver and pancreas	—	—	—	—	—	—	—	—	—	—	—	—
Diseases of Genito-Urinary System	11	—	11	4	—	4	—	—	19	8	—	—
X. Diseases of the Skin and Cellular Tissues	—	—	—	—	—	—	—	—	3	2	—	—
XIII. Diseases of the Bones and Organs of Movement	—	—	—	—	—	—	—	—	—	—	—	—
XIV. Congenital Malformation	6	—	6	2	—	2	—	—	8	10	1	10-0
XVI. Symptoms and Ill-defined Conditions	—	—	—	—	—	—	—	—	—	—	—	—
XVII. Accidents, Poisoning and Violence	4	—	4	7	—	7	8	2	19	3	2	65-6
Accidental falls	—	—	—	—	—	—	—	—	—	—	—	—
Therapeutic misadventure	—	—	—	—	—	—	—	—	—	—	—	—
Total	115	14	115	125	27	125	128	111	368	329	57	16-8

*Age and Parity of the Mothers in the Series*

Many references have been made in the text of this Report concerning the need for a better selection of cases for hospital confinement based on the "priority" classes.

*Table 3. Age of Mother (1955-1957)*

		Numbers		Percentage Distribution		
		"True" Maternal Deaths	"Associated" Deaths	"True" Maternal Deaths	"Associated" Deaths	Total Registered Births
Under 20	..	24	10	3.5	2.9	5.4
20-24	..	114	62	16.8	18.3	29.0
25-29	..	156	89	23.0	26.3	31.7
30-34	..	143	84	21.1	24.8	20.4
35-39	..	160	59	23.6	17.4	10.2
40 +	..	81	35	11.9	10.3	3.2
Total	..	678	339	99.9	100.0	99.9

Table 3 shows the age distribution of mothers in the enquiry compared with the total births. It shows that there is a higher proportion of fatalities among the women over the age of 30 years.

There has been little change since the last report.

*Table 4. Parity (1955-1957)*

			Numbers		Percentage Distribution		
Parity			"True" Maternal Deaths	"Associated" Deaths	"True" Maternal Deaths	"Associated" Deaths	Registered Legitimate Live Births
1	..	..	242	124	36.3	36.8	40.0
2	..	..	134	82	20.1	24.3	29.8
3	..	..	111	53	16.7	15.7	15.1
4	..	..	71	29	10.7	8.6	7.3
5	..	..	34	13	5.1	3.9	3.7
6 +	..	..	74	36	11.1	10.7	4.1
Not stated	..	..	12	2	—	—	—
Total	..	..	678	339	100.0	100.0	100.0

Table 4 shows that there has been a change in the distribution of the proportion of women in the various parities compared with previous report. Whereas in 1952-1954 the proportion of primigravidae among the maternal deaths was higher than among the total births, it is now slightly lower.

Table 5 gives a more detailed analysis of the age and parity. It shows that the fall in the proportion of deaths in the primigravidae has occurred mainly in the age group 25-29. Primigravidae over the age of 30 and multiparae over the age of 35 continue to be at a high risk, together with women with the fifth or more baby.

Table 5. "True Maternal Deaths". Age and parity of the 666 women whose age and parity was known

PARITY												
Age	No. 1	%	No. 2	%	No. 3	%	No. 4	%	No. 5	%	No. 6 +	%
Under 20 ..	22	3/3 (4.2)	1	0.2 (0.6)	—	—	—	—	—	—	—	—
20-24 ..	76	11.4 (18.1)	23	3.5 (8.4)	7	1.1 (2.4)	4	0.6 (0.6)	1	0.2 (0.2)	—	—
25-29 ..	59	8.9 (11.7)	48	7.2 (11.7)	25	3.8 (5.4)	17	2.6 (2.3)	4	0.6 (1.0)	2	0.3 (0.6)
30-34 ..	44	6.6 (4.3)	29	4.4 (6.5)	31	4.7 (4.5)	16	2.4 (2.4)	6	0.9 (1.3)	13	2.0 (1.3)
35-39 ..	23	3.5 (1.3)	29	4.4 (2.2)	35	5.3 (2.2)	26	3.9 (1.5)	12	1.8 (0.9)	33	5.0 (1.4)
40 + ..	18	2.7 (0.3)	4	0.6 (0.4)	13	2.0 (0.6)	8	1.2 (0.5)	11	1.7 (0.3)	26	3.9 (0.8)

The figures shown in brackets are the percentages in each age and parity group among all legitimate births in England and Wales.

Table 6. Percentage of Women Delivered in Hospital by Age and Parity for 1955-1957 among "True" deaths, excluding abortions and ectopic pregnancies in the enquiry series compared with the total births in England and Wales

Age	Parity					
	1		2-4		5 +	
	Enquiry Series	England and Wales	Enquiry Series	England and Wales	Enquiry Series	England and Wales
Under 25 ..	83.7	81.2	75.8	51.4	—	34.9
25-34 ..	92.8	83.8	70.1	51.5	63.6	37.5
35 + ..	97.2	83.6	81.7	59.8	80.3	47.1
Total ..	90.0	82.3	74.7	52.7	76.3	41.8



Omitted from Table:

- 80 deaths in which there was no labour,
- 4 deaths where the place of labour was not stated,
- 9 deaths where the parity was not stated.

Table 6 shows by age and parity the proportion of women whose death was directly due to pregnancy and childbirth (excluding abortion and ectopic pregnancy), who had their labour in hospital compared with the proportion of women in the country as a whole. It can be seen that in all groups there was a high proportion of women who had their labour in hospital; but two groups are of particular interest, namely, primigravidae under the age of 25 years and women aged between 25 and 34 years having their fifth or more baby. The difference in the proportion of young primigravidae who were confined in hospital is only slightly higher among the deaths than for the total births. In view of the fact that there has been a very small increase in the proportion of deaths among this group since the last report, and that the number of young primigravidae is increasing each year, this group of women may merit further study. While among the fatal cases, a much higher proportion of women with their fifth or more baby are confined in hospital than in the country as a whole, over one-third of the deaths among the vulnerable group still occur in women confined at home. The need for hospital confinement among these women is constantly emphasised throughout this report.

#### *Method of Classification of the Cause of Death*

The headings used in Tables 1 and 2 of the Appendix to describe the cause of death are the same as those used in the International Statistical Classification of Diseases, Injuries and Causes of Death (6th Revision, 1948). A full description of the system of classification was given on page 58 of the report for 1952 to 1954, and the same method has been used in this report.

#### *Comparison of the enquiry series with the registered maternal deaths*

Though every effort is made to obtain reports on each maternal death, it is inevitable that a certain number will be missing from the enquiry. Table 7 shows the number of cases included during this period.

*Table 7. Comparison of registered maternal deaths with those in the Enquiry*

	"True Maternal Deaths"		Associated Deaths	
	1952-54	1955-57	1952-54	1955-57
Number in the R.G.'s, total	1,403	1,112	409	368
Number in the Enquiry . .	1,094	861	316	339
Percentage in the Enquiry	78.0	77.4	77.3	92.1

When comparing deaths assigned to "true" or associated causes, it must be noted that a death classed as a "true" maternal death by the Registrar General on the basis of the information supplied in the death certificate, may be classed

in the Report as an associated death on the extra knowledge supplied in the confidential enquiry; or vice versa.

There were 361 deaths registered by the Registrar General which were missing from the enquiry. There were, however, 96 deaths which, due to faulty or incomplete certification of death, were not registered as maternal deaths by the Registrar General but, with the extra information available on the enquiry forms, were considered to be due to or associated with maternal causes.

*Table 8. Missing cases according to diagnosis*

Cause of Death on Death Certificate	Missing Cases				Per Cent. Among all Registered Maternal Deaths	
	1952-1954		1955-1957		1952-1954	1955-1957
	No.	Per Cent.	No.	Per Cent.		
Toxaemia .. ..	79	17	56	16	20	18
Abortion + ectopic pregnancy .. ..	87	18	78	22	18	18
Remainder due to pregnancy and childbirth..	148	31	113	31	39	40
Associated causes ..	159	34	114	32	23	25
Total .. ..	473	100	361	101	100	101

Table 8 shows the missing cases according to diagnosis. No undue proportion of deaths due to pregnancy and childbirth is missing from the Enquiry, and it would be reasonable to regard the enquiry as representing a fair sample of the main groups of causes of death. Compared with the previous report, there has been little change in the proportion of cases missing from the enquiry.

## APPENDIX II

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